UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

PC Code: 030093
DP Barcode: 429728

April 11, 2017

MEMORANDUM

SUBJECT: **Florpyrauxifen-benzyl:** Environmental Fate and Ecological Risk Assessment for the Section 3 New Chemical Registration

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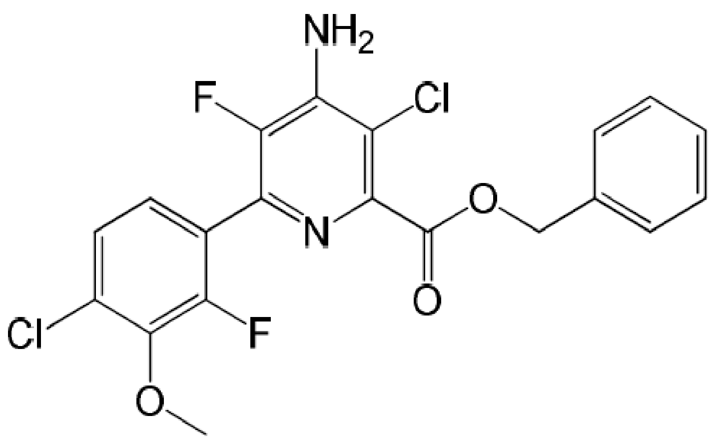
Please find attached the Environmental Fate and Effects Division's FIFRA Section 3 environmental fate and ecological effects risk assessment for the new active ingredient florpyrauxifen-benzyl (PC Code 030093). This assessment is based on the proposed label applications for weed control on rice (both pre-flooded and post-flooded fields), foliar 'burn-down' applications and aquatic herbicide uses. Florpyrauxifen-benzyl (also known as XDE-848 benzyl ester) is proposed as an herbicide for the use pre- and post-flooding use on rice in Arkansas, Florida, Louisiana, Mississippi, Missouri, South Carolina, Tennessee and Texas, and for certain aquatics uses, including foliar application to emergent vegetation or direct application to water body (in-water).

Environmental Fate and Ecological Effects Risk Assessment for the Registration of the New Herbicide for the Use on Rice and Aquatics

Florpyrauxifen-benzyl



Florpyrauxifen-benzyl (XDE-848 Benzyl Ester, Rinskor™)
PC Code 030093
CAS No. 1390661-72-9

Date: April 11, 2017 **DP Barcode:** D429728

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1. EXECUTIVE SUMMARY

1.1. Purpose

This ecological risk assessment (ERA) quantifies the potential ecological risks associated with the proposed uses of the new systemic herbicide, florpyrauxifen-benzyl (XDE-848 benzyl ester or Rinskor™; IUPAC name: Benzyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carboxylate). It is based on the best available scientific information on the proposed use, environmental fate and transport, and ecological effects of florpyrauxifen-benzyl on non-target organisms. Per the label, florpyrauxifen-benzyl is being proposed for the use pre- and post-flooding "for selective post-emergence grass, sedge, and broadleaved weed control in rice in the states of Arkansas, Florida, Louisiana, Mississippi, Missouri, South Carolina, Tennessee and Texas"[1] and for aquatic uses, including foliar application to emergent aquatic vegetation (foliar-aquatic) or direct application to water body (in-water). Based on the proposed label, the aquatics uses are intended for "management of freshwater aquatic vegetation in ponds, lakes, reservoirs, marshes, wetlands, bayous, drainage ditches, canals, and other aquatic sites, including vegetation control on shoreline and riparian areas within or adjacent to these sites."

1.2. Environmental Fate and Transport Summary

Florpyrauxifen-benzyl has a relatively low water solubility (15 ppb in water) and it appears to show a moderate potential for volatilization. In aqueous systems, the octanol/water partition coefficient suggests that the chemical has the potential to sorb onto organic matter associated with suspended material and benthic sediment. Although its K_{OW} is high, the fish BCF study shows a low potential to bioconcentrate in fish tissue, suggesting *in-vivo* metabolism may be important in limiting its bioaccumulation potential. Florpyrauxifen-benzyl is relatively short lived in aquatic metabolism systems (2-6 days), which further limits its potential for bioconcentration in the environment.

For florpyrauxifen-benzyl, the main route of degradation in shallow clear waters is aqueous photolysis, and to a lesser degree soil photolysis and soil and/or aquatic metabolism. In aqueous systems in the absence of light, florpyrauxifen-benzyl is more persistent. In soil and water sediment systems, biodegradation are the processes expected to affect the fate of the chemical. In the laboratory studies conducted with florpyrauxifen-benzyl, several degradates were observed[2]. XDE-848 acid is the product of de-esterification of the parent. Alternatively, the parent compound can undergo demethylation (methoxy group), to yield XDE-848 benzyl hydroxy, which in turn

[1] Currently the label does not list applications on rice in the state of California in any of the labels.

[2] In the lab studies, the following degradates were observed: XDE-848 acid, XDE-848 hydroxy acid, XDE-848 benzyl hydroxy, des-chloro XDE-848 acid, des-chloro XDE-848 benzyl ester, benzoic acid, benzyl alcohol, nitro hydroxy acid and X12421263.

may hydrolyze to form XDE-848 hydroxy acid. Under the influence of light, dechlorination of the chloride moiety in the pyridine ring yields des-chloro XDE-848 benzyl ester, which hydrolyzes to des-chloro XDE-848 acid. Ultimately, excess florpyrauxifen-benzyl mineralizes or binds to the soil or sediment. In a fish BCF study, the only degradate observed in significant amounts was XDE-848 acid.

Based on the available environmental fate data on parent florpyrauxifen-benzyl, the majority of the mass of parent is expected to reach paddy water/soil and to partition into the soil and degrade with half-life values ranging from about 2 weeks to 2 months, depending on the aerobic and flooded status of the soil. For the foliar aquatic use, and for the direct in-water applications, parent reaching water bodies by drift or applied directly to water, may degrade rather quickly ($t_{½}$ = 4 – 6 days in aerobic aquatic, and ~2 days in anaerobic aquatic environments); however, it is expected that in bodies of water at low pHs the degradation will slow down. In the soil and aquatic environments, a number of degradates are expected as described above. Note that the half-lives for the total toxic residues are larger than for the parent alone (see next paragraph), as will be described later in **Section 3.2**.

For aquatic plants, three degradates (*i.e.*, XDE-848 acid, XDE-848 hydroxy acid, and XDE-848 benzyl hydroxy), were considered residues of concern for ecological exposure (*i.e.*, stressors). They were included in the expression of the total toxic residues with the parent compound (TTRs), based on toxicity data, lack thereof, and structural considerations. These degradates persists longer than the parent compound; however, potential accumulation of the TTRs in sediment for extended periods of time appears to be low, since the degradates have more mobility than the parent compound. Based on comparison of their structures, and mobility, it is expected that the fate of the parent compound (an ester) and XDE-848 acid (an acid) to differ substantially.

For aquatic animals, only the parent compound was considered the stressor of concern. Available toxicity data shows that the degradates of florpyrauxifen-benzyl are less toxic to aquatic animals than the parent compound; therefore, only the parent compound was modelled in order to determine suitable aquatic EECs. For further information about the selection of the stressors of concern, see **Section 3.3**.

Aquatic exposure estimates for the rice uses of florpyrauxifen-benzyl were generated using the Pesticide in Flooded Application Model [PFAM v.2.0 (USEPA, 2016a)]. For the use of florpyrauxifen-benzyl in aquatic sites (in specific, the in-water applications), the Pesticides in Water Calculator (PWC v.1.52) was used with certain modifications, which included setting the application efficiency to zero (0) and the spray drift fraction to one (equivalent to 100%). This approach accounts for all routes of degradation/metabolism in the standard pond (refer to **Section 3.4.1**). The TTRs were modelled for aquatic plant exposure and risk assessment, using the K_{OC} for the parent compound (low mobility), and the K_{OC} for XDE-848 acid (high mobility).

Additionally, the parent alone was also modeled for aquatic animal exposure and risk assessment and for characterization purposes. For modelling results, refer to **Section 3.4.4** and **Tables 29 to 31**.

1.3. Ecological Effects Summary

Florpyrauxifen-benzyl TGAI was not acutely toxic up to its functional limit of solubility in tests of freshwater and estuarine/marine fish (approximately 40 µg a.i./L or ppb). In acute toxicity tests with the TEP, very little mortality was observed even at concentrations up to 3,200 µg a.i./L. Similarly, all tested transformation products were not acutely toxic to freshwater fish at concentrations up to and exceeding the application rate. Florpyrauxifen-benzyl TGAI was not chronically toxic to freshwater fish up to the limit of functional solubility (about 40 µg a.i./L).

Florpyrauxifen-benzyl TGAI was not acutely toxic up to its tested solubility limit (~25 to 60 ppb) in studies conducted on freshwater and estuarine/marine invertebrates. One typical end-use product (TEP), GF-3206, was classified as moderately toxic on an acute exposure basis to freshwater invertebrates (48-h EC_{50} = 1.3 mg a.i./L). All tested transformation products were not acutely toxic to freshwater invertebrates at concentrations up to and exceeding the maximum aquatic use application rate (150 ppb). Acute tests using transformation products on estuarine/marine invertebrates were not submitted. Chronic toxicity of the TGAI to water-column-dwelling freshwater invertebrates was not indicated up to is functional solubility limit in the test system (~40 µg a.i./L). For freshwater benthic-dwelling invertebrates, chronic effects were observed in sediment toxicity studies as low as 4.3 µg a.i./L (a NOAEC was not reached in this study because effects were observed at all test concentrations). Additionally, florpyrauxifen-benzyl TGAI is chronically toxic to saltwater invertebrates (mysid shrimp) at very low concentrations, with a reported LOAEC of 1.1 µg a.i./L and a NOAEC of < 1.1 µg a.i./L (*i.e.,* effects were observed at all test concentrations).

Studies on aquatic non-vascular plants (algae and diatoms) established unbounded 'greater-than' (>) IC_{50} values as low as 39 µg a.i./L. However, one test with TEP (GF-3206) established a definitive IC_{50} value of ~4.6 mg a.i./L. Furthermore, a definitive NOAEC value was established at 28.5 µg a.i./L, ~ 5x lower that the proposed maximum aquatic (in-water) usage rate.

As may be expected given the target organisms for rinskor, aquatic vascular plants (including Submerged Aquatic Vegetation, SAVs) were the most sensitive aquatic taxon in studies measuring exposure to florpyrauxifen-benzyl. The most sensitive aquatic plant tested was *Myriophyllum spicatum*, which established a NOAEC of 0.00483 µg/L, and a LOAEC of 0.0162 µg/L. This NOAEC value is ~31,000x lower than the proposed maximum in-water usage rate (the LOAEC is ~ 9,200 x lower).

Florpyrauxifen-benzyl is classified as practically non-toxic to birds, bees and mammals on an acute toxicity basis. In all cases, the acute studies established unbounded 'greater-than' (>) endpoints. One chronic effect in birds, a reduction in food consumption, was noted at the highest test level (999 mg a.i./kg). In the bee study, two bees in the treatment group were affected (problems with coordination, apathetic) after 4 hours, but these effects dissipated before the study's conclusion.

In terrestrial plant studies, dicots exhibited a greater sensitivity than monocots to florpyrauxifen-benzyl. It was also noted that vegetative-vigor studies established lower IC_{25} values than were established during seedling emergence studies. For dicots, soybean established a vegetative vigor IC_{25} of 0.0000469 lb a.i./A and a NOAEC of 0.000014 lb a.i./A, based on dry weight. For monocots, onion established a IC_{25} of 0.00415 lb a.i./A and a NOAEC of 0.0034 lb a.i./A, based on dry weight. The acid degradate (XDE-848 acid) showed toxicity to terrestrial plants within an order of magnitude as the parent TGAI.

1.4. Risk Determinations

Table 1 provides a summary of the environmental risk conclusions for aquatic and terrestrial organisms based on risk quotient (RQ) values and whether they exceed levels of concern (LOCs) for Federally-listed threatened and endangered species (hereafter refers to as 'listed' species) and non-listed species.

Table 1. Summary of Ecological Risk Conclusions for the Proposed Florpyrauxifen-benzyl Uses

Taxonomic Group	Summarized Risk Characterization and Major Uncertainties
Fish (freshwater and estuarine/marine) (plus aquatic-phase amphibians for which fish serve as surrogates)	Although the acute EECs for aquatic and rice uses (150 and 6.34 ppb, respectively) exceed or approach the highest concentration tested of the TGAI in acute toxic test with fish (~ 40 ppb), multiple lines of evidence suggest a low potential for acute risk to freshwater and estuarine/marine invertebrates. These include: • Lack of acute toxicity of the TGAI to rainbow trout and sheepshead minnow up to its functional solubility in test water with co-solvent present (~ 40 ppb) • Low solubility of TGAI in absence of solvent (15 ppb) • Low acute toxicity of the TEPs with carp (LC_{50} > 0.53 to > 3.2 ppm) relative to EECs • The TGAI's primary mode of action (auxin mimic) is plant-centric. For the rice and aquatic uses, chronic risks to freshwater fish are not indicated. No chronic data for estuarine/marine fish were submitted, therefore, chronic risks to estuarine/marine fish could not be determined.
Aquatic Invertebrates (freshwater and estuarine/marine): *Water Column-Dwelling*	Although the acute EECs for aquatic and rice uses (150 and 6.34 ppb, respectively) exceed or approach the highest concentration tested of the TGAI in acute toxic test with aquatic invertebrates (~ 40 ppb), multiple lines of evidence suggest a low potential for acute risk to freshwater and

Taxonomic Group	Summarized Risk Characterization and Major Uncertainties
	estuarine/marine invertebrates which reside primarily in the water column. These include: • Lack of acute toxicity of the TGAI to invertebrates up to its functional solubility in test water with co-solvent present (~ 40 ppb) • Low solubility of TGAI in absence of solvent (15 ppb) • Low acute toxicity of the TEPs with oyster (EC_{50} > 270 ppb) • The TGAI's primary mode of action (auxin mimic) is plant-centric. Chronic effects to freshwater (water-column) invertebrates from the rice or aquatic use are not indicated. For estuarine/marine (water column) invertebrates, risks are indicated for the aquatic uses both with the typical and maximum rates based on exceedance of the LOAEC for mysid shrimp (chronic RQs: >2.5 to >7.4). Since a NOAEC was not achieved with the mysid chronic test (<1.1 ppb) and the chronic EEC for the rice use falls slightly below this non-definitive NOAEC (0.68 ppb), the potential for chronic risks to estuarine/marine invertebrates associated with the rice use cannot be reliably determined.
Aquatic Invertebrates (freshwater and estuarine/marine): *Sediment -Dwelling*	For freshwater benthic invertebrates, acute risks are not indicated for the rice or aquatic uses. Due to the lack of a definitive NOAEC for freshwater midge (NOAEC < 4.3 µg a.i./L in pore water and < 5,250 µg a.i./kg-OC), chronic risk to freshwater benthic invertebrates associated with the rice and aquatic uses cannot be determined with precision nor can it be reasonably precluded. For estuarine/marine benthic invertebrates, acute risks are not indicated but chronic risk cannot be determined with precision nor can it be reasonably precluded due to the lack of a definitive chronic NOAEC.
Aquatic Plants	<u>Non-vascular aquatic plants</u>: For the rice use pattern, the potential for risk to listed or non-listed non-vascular plants is not indicated since the RQs did not exceed the LOC of 1.0. For the aquatics use pattern, at the typical and maximum rates (50 and 150 ppb, respectively), risk to listed species is indicated (RQs ramge from 4 to 12), while risk to non-listed species cannot be discounted entirely (RQ < 3.9 since the IC_{50} was a non-definitive 'greater-than' (>) value). <u>Vascular aquatic plants</u>: There is potential risk to listed and non-listed vascular (elongating) plants exposed to florpyrauxifen-benzyl for both the rice and aquatic uses since the RQs exceeded the LOC for all the scenarios evaluated. Calculated RQs ranged from 410 to 31,300.
Terrestrial Plants	There is potential risk to listed and non-listed monocot and dicot terrestrial plants exposed to florpyrauxifen-benzyl, as the RQs exceeded the LOCs (1.0) depending on the use pattern. For the rice use, risk is indicated for dicots (RQ range = 0.63 to 96) and for monocots (RQ range = 0.26 to 1.2).

Taxonomic Group	Summarized Risk Characterization and Major Uncertainties
	For the aquatic foliar use, risk is indicated for dicots (RQ range = 56 to 188) and for monocots (RQ range = 0.63 to 0.78). A spray drift analysis was conducted and it was found, depending on the application conditions (ground or aerial, droplet size, wind speed, boom height, *etc.*), that buffer zones ranging from 331 to >2,600 feet were required in order reach a point at which the RQ is at or below the LOC. Risk was also identified for crops irrigated with water treated with florpyrauxifen-benzyl, even if the concentration of the chemical is as low as 1 ppb, like suggested by the label. Irrigation at a concentration of 1 ppb, with as little as 0.062 inches of water, has the potential to exceed the listed species LOC, based on the lowest NOAEC for soybean, a dicot. Sreening-level comparisons of two co-formulation products: one using cyhalofop (GF-3480) and one using penoxsulam (GF-3530) were conducted. Vegetative vigor endpoint data indicate that GF-3480 demonstated markedly higher phytotoxicity to corn and onion, when compared to GF-3206 (florpyrauxifen-benzyl only), while GF-3530 demonstated markedly higher phytotoxicity to oilseed rape. Furthermore, neither co-formulation substantially increased phytotoxicity to soybeans, the most sensitive crop to GF-3206. Consequently, based on these two studies, the co-formulations alter the selectivity-of-target without altering the overall risk profile based on the single a.i. formulations alone. A compost residue study has not been submitted for florpyrauxifen-benzyl and its residues. Based on the total toxic residue persistence in laboratory metabolism studies, there is a potential for residue persistence and, consequently, phytotoxic injury to crops that receive contaminated compost, depending on the residues remaining in compost.
Birds (plus terrestrial-phase amphibians and reptiles for which birds serve as surrogates)	There appears to be no potential for acute and chronic risk to birds, including piscivorous birds consuming aquatic organisms contaminated with florpyrauxifen-benzyl. RQ values did not exceed the acute or chronic risk LOCs.
Mammals	There appears to be no potential for acute risk to mammals, including piscivorous mammals consuming aquatic organisms contaminated with florpyrauxifen-benzyl. RQ values did not exceed the acute risk LOCs. A potential for chronic risk was indicated for small piscivorous mammals whose diet is largely composed of aquatic invertebrates. However, this chronic risk determination is considered highly conservative and is sensitive to several key assumptions.
Bees	Based on Tier 1 acute contact and acute oral risk assessment of adult honey bees, there is no acute risk to adult bees. The RQ values do not

Taxonomic Group	Summarized Risk Characterization and Major Uncertainties
	exceed the acute risk LOC (0.4). There is no information on florpyrauxifen-benzyl's toxicity to individual bee larvae or chronic toxicity to adult bees. For the aquatic foliar use pattern, florpyrauxifen-benzyl could reach attractive non-target plants through spray drift and chronic risk cannot be precluded.

1.5. Uncertainties

A number of uncertainties were identified in this assessment. They lie in the following major categories (for details refer to **Section 5.2.5** of the Risk Description):

- Environmental fate database issues and its related uncertainties.
- Aquatic modeling uncertainties: PFAM and PWC.
- Uncertainties due to missing triggered studies: Marine Benthic (850.1740), marine Fish Early-Life Stage toxicity test (ELS) (850.1400).
- Uncertainties due to non-definitive 'less-than' (<) chronic NOAECs for estuarine/marine invertebrates (mysid shrimp) and freshwater midge.
- Uncertainties in the extent to which sensitive non-target, aquatic organisms may be exposed as florpyrauxifen-benzyl residues move downstream.

2. PROBLEM FORMULATION

The problem formulation establishes the objectives of and provides a framework for the risk assessment of florpyrauxifen-benzyl (XDE-848 Benzyl Ester, Rinskor™). It also provides a plan for characterizing the risk (US EPA 1998) for this new chemical assessment.

By identifying the important components of the risk assessment process, the problem formulation focuses the assessment on the most relevant ecological receptors (species), chemical properties, exposure routes, and endpoints. The structure of this risk assessment is based on guidance contained in U.S. EPA's *Guidance for Ecological Risk Assessment* (USEPA 1998) and is consistent with procedures and methodology outlined in the *Overview Document* (USEPA 2004).

2.1. Nature of Regulatory Action

The purpose of this assessment is to evaluate the environmental fate and ecological risks for the proposed new registration of the herbicide florpyrauxifen-benzyl. Under Section 3 of the Federal

Insecticide, Fungicide, and Rodenticide Act (FIFRA), U.S. EPA is required to evaluate the potential of new pesticides (and new pesticide uses) to cause adverse effects to the environment. To these ends, this assessment follows U.S. EPA's guidance on conducting ecological risk assessments and policies for assessing risk to non-target and listed organisms (U.S. EPA, 1998 and U.S. EPA, 2004).

2.2. Nature of Chemical Stressor

2.2.1. Overview of Chemical Usage

Florpyrauxifen-benzyl (Rinskor™, TGAI, XDE-848 Benzyl Ester) is a synthetic picolinate auxin and acts as plant growth hormone. It is proposed for use for "post-emergence grass, sedge, and broadleaf weed control in rice in the states of Arkansas, Florida, Louisiana, Mississippi, Missouri, South Carolina, Tennessee and Texas." Furthermore, it is proposed to be used as a herbicide for management of freshwater aquatic vegetation in ponds, lakes, reservoirs, marshes, wetlands, bayous, drainage ditches, canals, and other aquatic sites, including vegetation control on shoreline and riparian areas within or adjacent to these sites." There are four products containing florpyrauxifen-benzyl, all of which are liquid formulations to be applied by either ground or aerial spraying. Two of the products are co-formulated with the herbicides penoxsulam (PC Code 119031) and cyhalofop (PC Code 082583), respectively, for use on rice. Only GF-3301 is intended for aquatic uses.

2.2.2. Pesticide Type, Class, and Mode of Action

According to the proposed labels, "Florpyrauxifen-benzyl is classified as an auxin herbicide (WSSA Group 4; HRAC Group O)"[3]. This class of hormones (along with gibberellins) promote stem elongation in vascular plants. As with most hormones, having an optimal auxin concentration is critical to an organism's health (having too low of an auxin concentration stunts growth, while having too much can cause cell wall damage, leading to death). This effect can be exploited to create highly effective auxin-based herbicides. According to the WSSA website,[4] Group 4 "are herbicides that act similar to that of endogenous auxin (IAA) although the true mechanism is not well understood. The specific cellular or molecular binding site relevant to the action of IAA and the auxin-mimicking herbicides has not been identified. Nevertheless, the primary action of these compounds appears to affect cell wall plasticity and nucleic acid metabolism. These compounds are thought to acidify the cell wall by stimulating the activity of a membrane-bound ATPase proton pump. The reduction in apoplasmic pH induces cell elongation by increasing the activity of enzymes responsible for cell wall loosening. Low concentrations of auxin-mimicking herbicides

[3] WSSA = Weed Science Society of America; HRAC = Herbicide Resistance Action Committee.
[4] URL: http://wssa.net/wp-content/uploads/WSSA-Mechanism-of-Action.pdf (accessed October 28, 2016).

also stimulate RNA polymerase, resulting in subsequent increases in RNA, DNA, and protein biosynthesis. Abnormal increases in these processes presumably lead to uncontrolled cell division and growth, which results in vascular tissue destruction. In contrast, high concentrations of these herbicides inhibit cell division and growth, usually in meristematic regions that accumulate photosynthate assimilates and herbicide from the phloem. Auxin-mimicking herbicides stimulate ethylene evolution which may in some cases produce the characteristic epinastic symptoms associated with exposure to these herbicides."

2.2.3. Overview of Physicochemical, Fate, and Transport Properties

Florpyrauxifen-benzyl is characterized by a relatively low water solubility (~15 ppb) with a low potential for volatilization from dry/wet and water surfaces and is rain-fast in approximately 2 hours after application (based on the labels). In aqueous systems, the octanol/water partition coefficient suggests that the chemical has the potential to sorb onto benthic detritus as well as bioconcentrate in aquatic organisms such as fish. Florpyrauxifen-benzyl is expected to be affected by aqueous photolysis (natural water half-life = 0.16 days), and to a lesser degree soil photolysis and soil and/or aquatic metabolism. In turbid or deeper aqueous systems (including water high in tanins or sediment), florpyrauxifen-benzyl may be more persistent (hydrolysis, pH 7 half-life = 111 days). In soil and water sediment systems, biotransformation/ biodegradation are processes that are expected to affect the fate of florpyrauxifen-benzyl. In the laboratory studies conducted with florpyrauxifen-benzyl, a number of degradates were observed in variable amounts, depending on the study.

Florpyrauxifen-benzyl is an ester compound and as such degrades to an acid, especially in high pH environments and/or by metabolism mediated hydrolysis. Two other degradates of florpyrauxifen-benzyl are ester compounds that also hydrolyze: In aquatic and soil systems, the parent compound hydrolyzes to XDE-848 acid, which is a major degradate and is phytotoxic. Alternatively, it undergoes demethylation of the methoxy moiety, to yield XDE-848 benzyl hydroxy, which is also phytotoxic, and subsequently hydrolyzes/metabolizes to XDE-848 hydroxy acid. Under the influence of light in clear, shallow water, florpyrauxifen-benzyl rapidly undergoes dechlorination of the chloride moiety in the pyridine ring to yield des-chloro XDE-848 benzyl ester, which hydrolyzes to des-chloro XDE-848 acid. Other degradates, like nitro hydroxy acid was observed only in a few instances in the laboratory studies. Benzyl alcohol and benzoic acid were not considered of ecological concern. Ultimately, the test substance mineralizes or binds to the soil or sediment. Three of these degradates were considered stressors of concern for ecological exposure *to aquatic plants*, along with the parent compound, and were included in the expression of the total toxic residues (TTRs, see the next **Section 2.2.4**). The aquatic plants TTRs are much more persistent than the parent alone, especially in aquatic environments and under anaerobic conditions. It should be noted that the parent and the acid differ substantially structurally and their K_{OC} values indicate a large difference in mobility. Therefore, for modelling purposes, both K_{OC}

values were modelled to obtain a range of EECs, depending on the dominant structure in the environment with time.

The fish BCF study shows a much lower bioconcentration factor than would be predicted based solely on its K_{OW}, suggesting that *in-vivo* metabolism may be important for this compound. Detailed physicochemical, fate and transport properties for florpyrauxifen-benzyl and its transformation products are included in **Section 3.2** of this assessment.

2.2.4. Stressor Source, Identity, and Intensity

The stressor is the chemical(s) that negatively impact one or more biological systems. Stressor intensity is the product of the stressor's toxicity and magnitude of exposure, as measured in various environmental compartments. To that end, a complete analysis was conducted in which florpyrauxifen-benzyl and three of its major transformation products (XDE-848 acid, XDE-848 hydroxy acid and XDE-848 benzyl hydroxy) were determined to be the stressors in aquatic environments to aquatic plants; however, for aquatic animals, only the parent compound was considered the stressor of concern. The basis for these selections included the chemicals' persistence, toxicity data or lack thereof, structural considerations, and ECOSAR analysis. Details of this analysis are included in **Section 3.3** of this assessment.

2.3. Ecological Receptors

The receptor is the organism(s) that is exposed to the stressor (USEPA, 1998). Aquatic receptors potentially at risk to exposure to florpyrauxifen-benzyl include (but are not limited to): fish, amphibians, invertebrates (*e.g*., aquatic insects, amphipods, mollusks, crustaceans, and worms), vascular and nonvascular aquatic plants. Benthic receptors potentially at risk include (but are not limited to): insects and crustaceans.

Terrestrial receptors potentially at risk to exposure to florpyrauxifen-benzyl include (but are not limited to): birds, mammals, reptiles, amphibians, terrestrial invertebrates (*e.g*., insects, worms, arachnids), and vascular plants (**Table 2**).

Table 2. Acute and Chronic Measures of Effect and Taxonomic Groups and Test Species for Potential Effects of Florpyrauxifen-benzyl

Taxonomic Group	Surrogate Species	Assessment	Measure of Effect
Aquatic Animals (*Freshwater fish*[2])	Rainbow trout (*Oncorhynchus mykiss*) Fathead Minnow (*Pimephales promelas*) Common Carp (*Cyprinus carpio*)	Acute	Lowest tested EC_{50} or LC_{50} (acute toxicity tests)
		Chronic	Lowest NOAEC (early life-stage or full life-cycle tests)
Aquatic Animals (*Estuarine/marine fish*)	Sheepshead minnow (*Cyprinodon variegatus*)	Acute	Lowest tested EC_{50} or LC_{50} (acute toxicity tests)

Taxonomic Group	Surrogate Species	Assessment	Measure of Effect
		Chronic	Lowest NOAEC (early life-stage or full life-cycle tests)
Aquatic Animals (*Freshwater invertebrates*)	Water flea (*Daphnia magna*) Midge (*Chironomus riparius*) Scud (*Gammarus pseudolimnaeus*)	Acute	Lowest tested EC_{50} or LC_{50} (acute toxicity tests)
		Chronic	Lowest NOAEC (early life-stage or full life-cycle tests)
Aquatic Animals (*Estuarine/marine invertebrates*)	Mysid (*Americamysis bahia*) Eastern oyster (*Crassostrea virginica*)	Acute	Lowest tested EC_{50} or LC_{50} (acute toxicity tests)
		Chronic	Lowest NOAEC (early life-stage or full life-cycle tests)
Terrestrial Animals *Birds*[1]	Mallard duck (*Anas platyrhynchos*) Bobwhite quail (*Colinus virginianus*) Zebra finch (*Poephila guttata*)	Acute/Sub-acute	Lowest LD_{50} (single oral dose) and LC_{50} (subacute dietary)
		Chronic	Lowest NOAEC (21-week reproduction test)
Terrestrial Animals *Mammals*	Rat (*Rattus norvegicus*) Mice (unspecified)	Acute	Lowest LD_{50} (single oral dose test)
		Chronic	Lowest NOAEC (two-generation reproduction test)
Plants *Terrestrial non-listed (monocots and dicots)*	Monocots – Corn (*Zea mays*), Onion (*Allium cepa*), Oat (*Avena sativa*), and Ryegrass (*Lolium perenne*) Dicots Cucumber (*Cucumis sativus),* Carrot, (*Daucus carota*), oilseed rape (*Brassica napus*), Soybean (*Glycine max*), Sugarbeet (*Beta vulgaris*), and Sunflower (*Helianthus annuus*)	Acute	Lowest IC_{25} (seedling emergence and vegetative vigor)
Plants *Terrestrial listed (monocots and dicots*[3]*)*		Acute	IC_{05} or NOAEC associated with the lowest IC_{25} (seedling emergence and vegetative vigor)
Plants *Aquatic non-listed (vascular and non-vascular)*	Vascular Duckweed (*Lemna gibba*) Eurasian Watermilfoil (*Myriophyllum spicatum*), Carolina Fanwort (*Cabomba*	Acute	Lowest IC_{50}

Taxonomic Group	Surrogate Species	Assessment	Measure of Effect
Plants *Aquatic listed (vascular and algae)*	*caroliniana*), and Coontail (*Ceratophyllum demersum*) Non-vascular Cyanobacteria (*Anabaena flos-aquae*) Marine diatom (*Skeletonema costatum*) Freshwater diatom (*Navicula pelliculosa*) Freshwater green algae (*Peuedokirchneriella subcapitata*) Estuarine/marine non-vascular Marine diatom (*Skeletonema costatum*)	Acute	IC_{05} or NOAEC associated with the lowest IC_{50}
Terrestrial Invertebrates *Honey Bees*	Honey bee (*Apis mellifera*)	Acute	Lowest LD_{50}
		Chronic	Lowest NOAEC

[1] Birds represent surrogates for terrestrial-phase amphibians and reptiles.
[2] Freshwater fish represent surrogates for aquatic-phase amphibians.
[3] Four species of two families of monocots, of which one is corn; six species of at least four dicot families, of which one is soybeans.

Consistent with the process described in the *Overview Document* (US EPA, 2004), this risk assessment used a surrogate species approach in its evaluation of florpyrauxifen-benzyl. Toxicological data generated from surrogate test species, which are intended to be representative of broad taxonomic groups, are used to estimate potential effects on a broader range of species (receptors) included under these taxa.

Acute and chronic toxicity data from studies submitted by pesticide applicants, along with the available open-literature, are used to evaluate potential direct effects of pesticides to aquatic and terrestrial receptors. Since florpyrauxifen-benzyl is a new pesticide active-ingredient, the availability of open literature information on its toxicity is expected to be extremely limited. The evaluation of available data can also provide insight into the direct and indirect effects of florpyrauxifen-benzyl on biotic communities (both at the point-of-use and downstream/ downwind) due to loss of species that are sensitive to the chemical as well as changes in structure and/or function of the affected communities.

A table of the taxonomic groups and the tested surrogate species used to understand potential ecological effects of pesticides to non-target species is provided above (**Table 2)**. Where they apply, the table also provides a preliminary view of the acute toxicity profile of taxa exposed to florpyrauxifen-benzyl TGAI.

2.4. Ecosystems at Risk

Due to the wide geographic distribution of expected florpyrauxifen-benzyl application sites, many different types of ecosystems (aquatic and terrestrial) could potentially be at risk. Aquatic ecosystems that could be at risk include the treatment area, land and water bodies adjacent to, and/or downstream/downwind from the treatment area. These areas include (but are not limited to) impounded bodies such as ponds, lakes, reservoirs, freshwater-marshes and bayous as well as flowing waterways such as streams and rivers. In coastal areas, aquatic habitat also includes downstream estuarine/marine ecosystems, such as salt-marshes as well as saltwater bayous. Because florpyrauxifen-benzyl and florpyrauxifen-acid are phytotoxic to both vascular and non-vascular plants, all aquatic trophic levels would be impacted.

In the requested rice use, florpyrauxifen-benzyl could potentially be contained in a paddy during the growing season, allowing time for transformation/degradation to occur. In contrast, the proposed in-water use may allow for florpyrauxifen-benzyl to move downstream shortly after application. The extend to which downstream ecosystems are at risk includes a number of factors; including but not limited: efficacy, persistence and selectivity.

Terrestrial ecosystems that could be at risk include the lands directly adjacent to the treatment areas that may receive drift or runoff. Most notably, this could include cultivated fields (crops), fencerows and hedgerows, meadows, fallow fields or grasslands, woodlands, riparian habitats and other uncultivated areas.

2.5. Assessment Endpoints

Assessment endpoints represent the actual environmental value that is to be protected, defined by an ecological entity (species, community, or other entity) and its attribute or characteristics (USEPA, 1998). For florpyrauxifen-benzyl, the ecological entities may include the following: freshwater fish and invertebrates, estuarine/marine fish and invertebrates, birds, mammals, insects, terrestrial plants, and aquatic plants (both vascular plants and algae). The attributes for each of these entities, which typically include growth, reproduction, and survival and are discussed further in **Section 2.7**.

2.6. Conceptual Model

For a pesticide to pose an ecological risk, it must reach ecological receptors in biologically significant concentrations. An exposure pathway is the means by which a pesticide moves in the environment from a source until it contacts an ecological receptor. For an ecological pathway to be complete, it must have a plausible source, release mechanism, environmental-transport medium (route), and point of exposure (destination) to ecological receptors.

The conceptual model presented below is intended to provide both a graphical representation (flow-chart) and a narrative of predicted relationships between florpyrauxifen-benzyl, its routes of exposure, and the effects related to the Agency's assessment endpoints. The conceptual model consists of two major components: a pair of diagrams and a risk hypothesis. (USEPA 1998).

2.6.1. Risk Hypothesis

Risk hypotheses are statements of potential adverse ecological effects. These hypotheses are typically based on theory, logic, empirical data, regression models and probability models (EPA 1998). Furthermore, the goal of risk assessment is to evaluate if the risk hypothesis is supported by the aforementioned theory, logic, data and models. For florpyrauxifen-benzyl, the following ecological risk hypothesis is used in this assessment:

> *Based on environmental fate parameters, modes of incorporation, and measurable effects (on both plants and animals), as well as the nature of foliar and in-water applications of florpyrauxifen-benzyl to rice and aquatic environments, non-target aquatic and/or terrestrial organisms will be exposed to florpyrauxifen-benzyl and its degradates of ecological concern (*i.e.*, for aquatic animals, the residues of concern include only the parent compound, while the plant's total toxic residues = florpyrauxifen-benzyl + XDE-848 acid + XDE-848 benzyl hydroxy + XDE-848 hydroxy acid), when florpyrauxifen-benzyl is used in accordance with the label. Consequently, florpyrauxifen-benzyl and its degradation products have the potential to cause adverse effects to the survival, growth, and reproduction of non-target terrestrial and aquatic plants and animals.*
>
> *Because florpyrauxifen-benzyl TTRs are persistent and mobile (assuming the mobility of the acid), surface water used for irrigation purposes is a potential route of exposure for terrestrial and semi-aquatic plants. There is a potential for adverse effects to non-target terrestrial plants due to use of florpyrauxifen-benzyl-containing water for irrigation.*
>
> *Furthermore, given the persistence of parent and the TTRs observed in several of the laboratory soil metabolism studies, it appears that based on the Total Toxic Residue expected persistence, there is a potential for phytotoxic injury to crops that receive contaminated compost, depending on the residues remaining in compost.*

2.6.2. Diagram

The conceptual site model is a generic graphic depiction of the risk hypothesis, and assumes that the herbicide florpyrauxifen-benzyl, is capable of affecting aquatic and terrestrial animals provided that environmental concentrations are sufficiently elevated as a result of proposed label uses. Based on an examination of the physicochemical properties of florpyrauxifen-benzyl, the fate and disposition in the environment, and mode of application, a conceptual model was developed that represents the possible relationships between the stressors, ecological receptors, and the assessment endpoints. Through a preliminary iterative process of examining available data, the conceptual model (*i.e.*, the representation of the risk hypothesis) may be refined to reflect the likely exposure pathways and the organisms that are most relevant and applicable to this assessment (**Figures 1 to 3**). They include the potential pesticide or stressor (florpyrauxifen-benzyl, but the presence of toxicologically important metabolites cannot be ruled out; see **Section 3.3**), the sources and/or transport pathways, exposure media and exposure points, biological receptor types and attribute changes. As explained in **Section 3.3 (Stressor of Concern)**, for aquatic animals, the stressor is the parent, while for aquatic plants, the stressor was defined as florpyrauxifen-benzyl + XDE-848 acid + XDE-848 benzyl hydroxy + XDE-848 hydroxy acid.

In order for a chemical to pose an ecological risk, it must reach ecological receptors in biologically significant concentrations. An exposure pathway is the means by which a pesticide moves in the environment from a source to an ecological receptor. For an ecological exposure pathway to be complete, it must have a source, a release mechanism, an environmental transport medium, a point of exposure for ecological receptors, and a feasible route of exposure. In addition, the potential mechanisms of degradation/transformation (*i.e.*, which degradation/transformation products may form in the environment, in which media, and how much) must be understood, especially if for the chemical, its metabolites/transformation products are of toxicological concern. The assessment of ecological exposure pathways, therefore, includes an examination of the source and potential migration pathways for constituents, and the determination of potential exposure routes.

Under the possible uses of florpyrauxifen-benzyl, the sources and mechanisms of release of the compounds are from ground or aerial spray (on soil for dry seeded rice, or water), or direct in-water applications (based on information provided by the registrant, the in-water applications have a lower drift potential than the foliar applications; for example, the chemical can be injected in the water to reach deep vegetation). Note that this conceptual model considers agricultural applications (rice, **Figure 1**) as well as certain aquatic uses (**Figure 2**). The water from the field can be scheduled to be drained to adjacent bodies of water. Further, when the wet field is overloaded in a rain event, surface runoff could occur. Surface runoff from the areas of application is assumed to depend on factors such as topography, irrigation, and rainfall events. Direct deposition may result in contamination of food items that may be consumed by terrestrial organisms (**Figure 3**). Spray drift results in contaminated adjacent areas, including terrestrial habitats and bodies of water. Leaching to groundwater is not considered an important source because florpyrauxifen-benzyl shows low mobility in a variety of soils. Furthermore, leaching in rice fields is believed to be a minor component of water contamination, compared to the direct application to water in the field. Surface water concentrations of pesticides on rice are also expected to be higher than groundwater concentrations.[5] Florpyrauxifen-benzyl appears to have a

[5] CRC. 2013. *Rice-Specific Groundwater Assessment Report*. July 2013. Central Valley Regional Water Quality

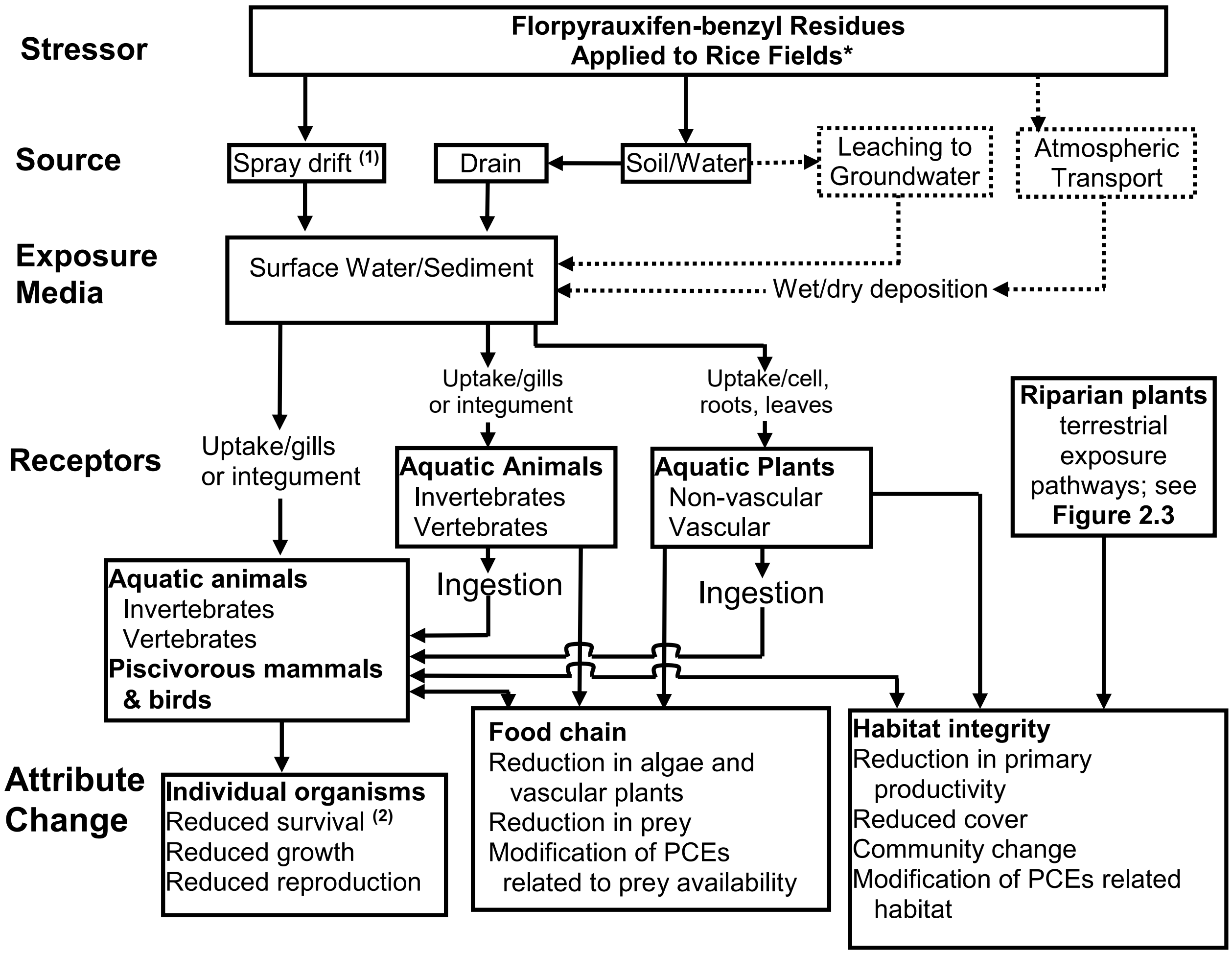
moderate potential for volatilization, with a relatively low vapor pressure, but a moderate Henry's Law Constant.

For aquatic receptors, the major point of exposure is through direct contact with the water column, sediment, and pore water (gill/integument) contaminated with direct water treatment, spray drift (from spray application), or runoff from treated areas. Indirect effects to aquatic organisms (fish and aquatic invertebrates) can also occur through impact to various food chains. The representative aquatic receptors are certain freshwater and estuarine/marine fish, invertebrates, and aquatic plants. The major point of exposure for terrestrial animals is consumption of food contaminated with residues such as grass, foliage, and insects. For plants, the point of exposure is direct contact or root uptake. The representative terrestrial receptors are mammals, birds and terrestrial plants. The attribute changes used to assess risk to terrestrial receptors depend on the type of test (*e.g.*, reduced survival, growth, or reproduction for animals and seedling emergence and vegetative vigor for plants). It should be noted, that these species do not cover all the possible species in the animal and plant kingdoms; certain taxa are considered as surrogates for other taxa. For example, fish are considered surrogates for aquatic phase amphibians.

This conceptual model also shows details about biomagnification for a chemical (see piscivorous birds and mammals in **Figures 1 and 2**). The reported value of log octanol/water partition coefficient of 5.5 ($K_{OW} = 3.1 \times 10^5$) suggests that florpyrauxifen-benzyl has the potential to bioaccumulate in aquatic organisms, assuming that chemical metabolism is negligible. However, the measured bioconcentration factor in fish is much lower than that expected based on K_{OW} alone (**Table 8**), which suggests that florpyrauxifen-benzyl metabolism by fish is substantial. Furthermore, the aquatic metabolism half-lives of the parent compound ranges from 2-6 days, which further limits the potential exposure. However, this exposure route will also be explored.

Florpyrauxifen-benzyl shows a moderately low solubility (0.015 ppm), a high K_{OW}, and also high K_{OC}s. These properties suggest that the chemical partitions with the sediments, and with organic matter, suspended in the water bodies. Florpyrauxifen-benzyl total residues are, however, less likely to concentrate in the sediments, especially after repeated exposures (applications). The reason is that the parent compound's half-life in aquatic environments is moderate and the main degradates are compounds with higher mobility than the parent. These issues are also addressed in the risk assessment for florpyrauxifen-benzyl.

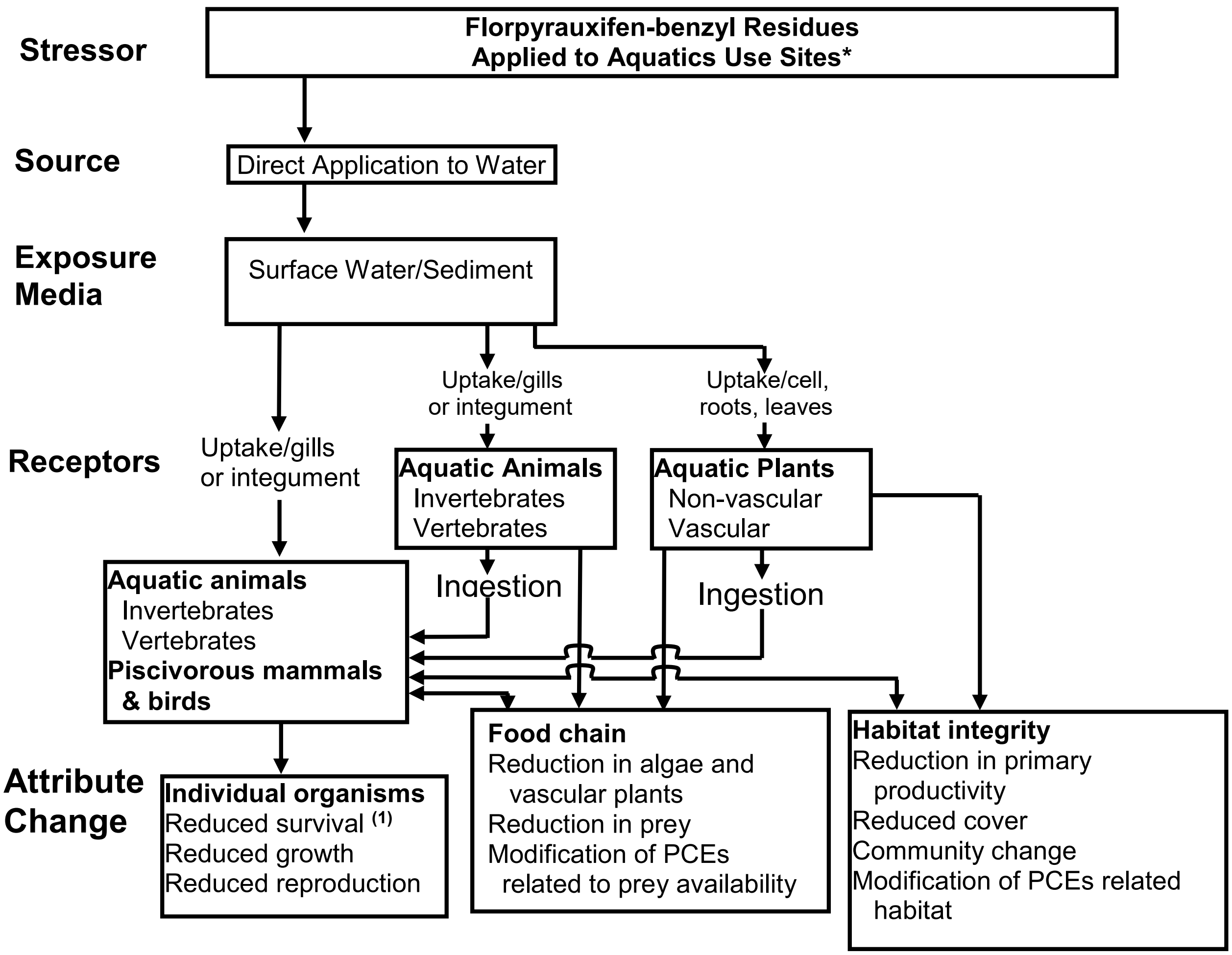
Control Board. California Rice Commission. Available at the following URL (accessed May 21, 2016): http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/regulatory_information/rice_growers_sacvalley_wdrs/2013july_crc_gar_final.pdf.



Dotted lines indicate exposure pathways that have a low likelihood of contributing to ecological risk.
*Florpyrauxifen-benzyl residues include the parent compound for aquatic animals, and parent + XDE-848 acid + XDE 848 benzyl hydroxy + XDE 848 hydroxy acid for aquatic plants.
[1] Applies only to drinking water assessments in PFAM.
[2] Immobilization is considered equivalent to mortality in toxicity tests for aquatic invertebrates.

Figure 1. Conceptual diagram for potential risks of florpyrauxifen-benzyl to aquatic organisms for rice agricultural uses of the chemical that end up in surface water or sediment

Based on the White Paper for the PFAM model (USEPA 2016b), for risk to aquatic animals, "exposure is evaluated in the rice paddy for organisms that may move onto the field by comparing toxicity endpoints to estimated exposure in the rice paddy." As exposure is estimated in the rice paddy for ecological risk assessment, releases of water after an application could reduce estimated exposure in the paddy, leading one to potentially erroneously conclude that risk could be reduced by early paddy releases. The risk, however, *would move with the residues* in the water after they left the paddy and it is uncertain to what extent residues in the water would be diluted after the water left the rice paddy as some receiving canals that water will flow into may not have much water in them or the water may be coming from releases from rice paddies upstream (note that other processes also occur in the field, such as degradation/metabolism). Therefore, to follow the residues in the water and to provide a protective bound for risk for ecological organisms, the PFAM model assumes water is held on the rice paddy after the application and until harvest. While it is acknowledged that typically risk to aquatic plants would be assessed off the rice paddy for aquatic and terrestrial plants, exposure to aquatic plants in waters adjacent to the rice paddy may be similar to exposure in the rice paddy and estimates of the degree of dilution are not available. Risk to aquatic plants could be characterized using the estimated pesticide concentrations in the rice paddy, as recommended for other aquatic organisms.

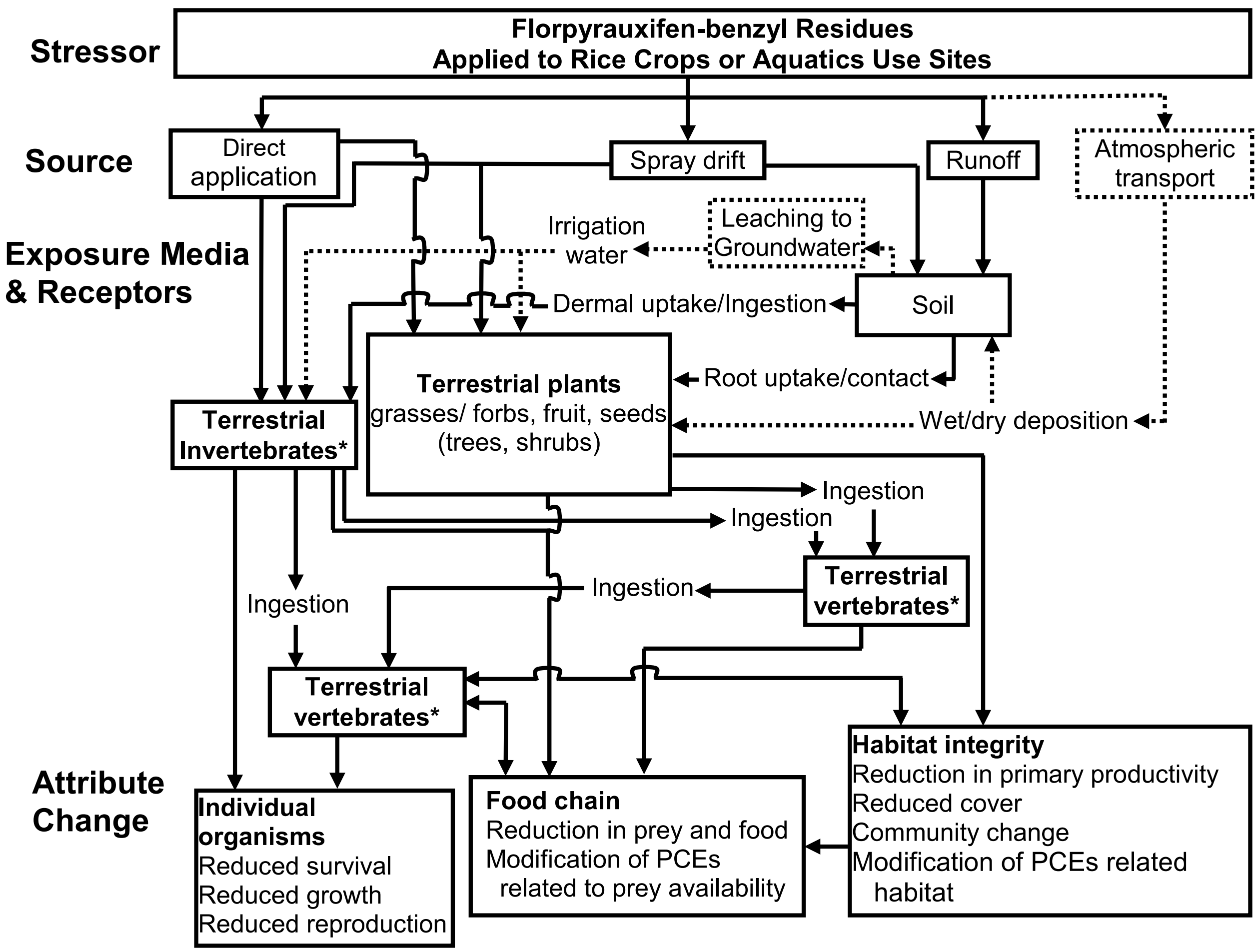


*Florpyrauxifen-benzyl residues include the parent compound for aquatic animals and parent + XDE-848 acid + XDE 848 benzyl hydroxy + XDE 848 hydroxy acid for aquatic plants.

[1] Immobilization is considered equivalent to mortality in toxicity tests for aquatic invertebrates.

Figure 2. Conceptual diagram for potential risks of florpyrauxifen-benzyl to aquatic organisms for aquatics uses of the chemical that end up in surface water or sediment

Figure 3 shows that the primary exposure routes for terrestrial organisms include direct contact with spray droplets, dermal contact with foliar residues, uptake from soil (plants and soil invertebrates) and consumption of contaminated foliage (herbivorous animals). Inhalation is not considered an exposure route of concern based on results of the Screening Tool for Inhalation Risk model (STIR; version 1.0; refer to **Section 2.7.2**). Additionally, ingestion of contaminated drinking water is also not considered a potential exposure route of concern based on results of Screening Imbibition Program (SIP; version 1.0; refer to **Section 2.7.2**). Furthermore, the primary exposure routes of concern for managed bees (*e.g.*, honey bees), include direct contact with spray droplets, dermal contact with foliar residues, and ingestion through consumption of contaminated pollen, nectar and associated processed food provisions (*e.g.,* brood food, royal jelly, propolis). Exposure of hive bees via contaminated wax is also possible, although difficult to quantify at this time. Exposure of bees through contaminated drinking water is not expected to be nearly as important as exposure through direct contact or pollen and nectar (USEPA, 2014). Although bees are not attracted to rice crops, the foliar applications can result in spray drift to adjacent zones. Further, for the foliar aquatics uses, spray drift can be an issue whenever the droplets reach non-target plants.



Dotted lines indicate exposure pathways that have a low likelihood of contributing to ecological risk.

Figure 3. Terrestrial conceptual model depicting stressors, exposure pathways, and potential effects to terrestrial organisms from the use of florpyrauxifen-benzyl on rice or aquatics use sites

2.7. Analysis Plan

2.7.1. Methods for Conducting Ecological Risk Assessments

The primary method used to assess risk in this ecological risk assessment is the risk quotient (RQ), which emulates methods outlined in the EPA Overview Document (EPA, 2004). The RQ is a comparison (a ratio) of measures-of-exposure to measures-of-effect (toxicity).

The measure-of-exposure is the estimated exposure concentration (EEC) and the measure-of-effect values are the median lethal dose at 50% mortality (LD_{50}), medial lethal concentration at 50% mortality (LC_{50}), as well as the no observed adverse effect level (NOAEL), and the no observed adverse effect concentration (NOAEC). The resulting ratio of the point-estimate of exposure and the point-estimate of toxicity, *i.e.*, the RQ, is then compared to a specified level of concern (LOC), which represents a minimum threshold for concern. If the RQ exceeds the LOC, risks concerns are triggered. Risk presumptions, along with the corresponding RQs, equations, and LOCs are summarized in **Section 5** of this assessment.

2.7.2. Measures of Exposure

Measures of exposure are estimates for a receptor that can be determined by modeling or monitoring data. Measures of exposure for florpyrauxifen-benzyl, are obtained from modeling efforts and, for the in-water use, the label recommended target concentration, as this is a new chemical and national-scale monitoring data are not available. Exposure models used for this assessment include the suite of standard exposure models commonly used in pesticide risk assessments (USEPA, 2004).

Aquatic exposure estimates are generated from selected EPA water models and incorporate maximum proposed use rates, minimum application intervals, and empirically-derived fate properties. The Pesticides in Flooded Application Model (PFAM v.2.0, date released 09/30/2016) was used to model the rice uses of florpyrauxifen-benzyl.

For the use of florpyrauxifen-benzyl in aquatics use sites, the Pesticides in Water Calculator (PWC v.1.52, date released 04/01/2016) was utilized to estimate environmental exposure concentrations for the in-water applications in the standard pond, with certain modifications described in **Section 3.5**. For additional details on the use of these aquatic pesticide exposure models in this assessment, see **Section 3.5**.

Terrestrial wildlife may be exposed to florpyrauxifen-benzyl via consumption of residues on food items generated by spray applications. For spray applications, the T-REX model (Terrestrial Residue EXposure model; v. 1.5.2, dated June 6, 2013) is used to predict dietary exposure to florpyrauxifen-benzyl residues on foliar surfaces using the Kenaga nomogram as modified by

Fletcher (Hoerger and Kenaga 1972, Fletcher *et al.* 1994). A default 35-day foliar dissipation half-life is used for terrestrial exposure modeling in this assessment, as suitable foliar dissipation data specific to florpyrauxifen-benzyl are not available (*e.g.*, Willis and McDowell 1987). Estimated exposures of terrestrial insects to florpyrauxifen-benzyl are evaluated in terms of the insects' potential relevance as dietary items for terrestrial vertebrates and for use in risk characterization for listed terrestrial invertebrates. The conceptual approach taken to estimate residues (upper-bound and mean) in potential dietary sources for mammals and birds is presented in the model T-REX Version 1.5.2.

Similarly, the Bee-REX model (Bee Residue EXposure model; v. 1.0, dated October 30, 2015) is used to predict dietary exposure to florpyrauxifen-benzyl residues on foliar surfaces. While rice itself is not considered to be attractive to bees (USDA 2015), flowering plants adjacent to rice paddies (subject to spray drift) could be attractive to bees. Furthermore, emergent vegetation may also be attractive to bees during bloom.

The TerrPlant (v. 1.2.2; December 26, 2006) model is used to derive EECs relevant to terrestrial and emergent wetland plants for the proposed rice-use of florpyrauxifen-benzyl. The model employs the assumption that default fractions of the intended application are transported to an adjacent field through runoff and spray drift. Measures of exposure to terrestrial plants are expressed as a fraction of the mass of the florpyrauxifen-benzyl applied to the area of treated field (application rate).

AgDRIFT® (version 2.1.1, approved for use in EFED May 22, 2012), a modified version of the AGricultural DISPersal (AGDISP™) model developed by the U.S. Forest Service, was created under a Cooperative Research and Development Agreement between the EPA, the US Department of Agriculture's Forest Service, and the Spray Drift Task Force. The AgDRIFT® model has the capability to assess a variety of spray drift conditions from agricultural applications and off-site deposition of liquid formulation of pesticides. In this assessment, it was used to calculate buffer zones required to protect terrestrial plant species.

Bioaccumulation is assessed using the results from bioaccumulation in fish studies, as well as the KABAM model (K_{OW} (based) Aquatic Bio-Accumulation Model, version 1.0, April 2009), adjusting for biotransformation rates. KABAM is used to estimate potential bioaccumulation of hydrophobic organic pesticides in freshwater aquatic ecosystems and risks to mammals and birds consuming aquatic organisms which have bioaccumulated these pesticides.

The Screening Imbibition Program (SIP v.1.0) is used in the problem formulation stage of this risk assessment. SIP v.1.0 is intended to provide an upper bound estimate of exposure of birds and mammals to pesticides through drinking water. Risk quotients (RQs) for drinking water exposure are not derived. Instead, a ratio of exposure to toxicity comparison to the Agency's LOC for listed species determines whether or not drinking water may be a concern for mammals and/or birds.

The Screening Tool for Inhalation Risk (STIR v.1.0) is in the problem formulation stage of this risk assessment. STIR v.1.0 is intended to provide an upper bound estimate of exposure of birds and mammals to pesticides through inhalation of spray drift or vapor. It also provides an estimate of avian inhalation toxicity in the absence of such data. A comparison of the ratio of exposure to toxicity to a threshold, similar to the Agency's LOC for listed species, determines whether or not inhalation from spray drift or vapor phase of the pesticide alone may be a concern for mammals and/or birds.

More information about the above mentioned terrestrial and aquatic models can be found at the EPA website[6].

2.7.3. Measures of Effect

Measures of ecological effects are obtained from the suite of applicant-submitted studies conducted with a limited number of surrogate species. Furthermore, *the test species do not necessarily represent the most-sensitive species in their taxa,* but instead, were selected based on their ability to thrive under laboratory conditions. Measures of effect are based on deleterious changes in an organism as a result of chemical exposure. The preferred measures-of-effect for risk assessments are changes in survival, reproduction, and/or growth as determined from guideline laboratory toxicity tests. The benefit of focusing on these effects for quantitative risk assessment lies in the effect's relationship to higher-order ecological systems, including populations, communities, and ecosystems. Effects other than survival, reproduction, and growth may be considered, though rarely are they used quantitatively to estimate risks since the relationship between these effects and higher-order processes may be less direct.

Laboratory-derived toxicity values include estimates of acute mortality (*e.g.*, LD_{50}, LC_{50}), as well as estimates of effects to reproduction and/or growth due to longer term, chronic exposures (*e.g.*, NOAEC, NOAEL). For a given assessment endpoint, the lowest (*i.e.*, most sensitive) relevant measure of effect is used in estimating the RQ. Assessment endpoints and their respective measures of effect are listed in **Table 3** below.

Table 3. Summary of measures of exposure and effect for assessing the environmental risk of the proposed uses of Florpyrauxifen-benzyl

Assessment Endpoint	Measure of Exposure	Measure of Effect
Abundance (*i.e.* survival, reproduction, and growth) of individuals and populations of	Maximum (peak) residues on food items (foliar)	a. Zebra finch and northern bobwhite quail acute oral LD_{50} b. Mallard duck and northern bobwhite quail sub-

[6] URL: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment.

Assessment Endpoint	Measure of Exposure	Measure of Effect
birds[1]		acute dietary LC_{50} c. Mallard duck and northern bobwhite quail chronic reproduction NOAEC and LOAEC
Abundance (*i.e.* survival, reproduction, and growth) of individuals and populations of **mammals**.	Maximum (peak) residues on food items (foliar)	a. Laboratory rat acute oral LD_{50} b. Laboratory rat multi-generation reproduction chronic NOAEL and LOAEL
Survival and reproduction of individuals and communities of **freshwater fish**[2] and **invertebrates**.	Peak EEC (acute), 21-day, and 60-day surface water EEC (chronic)[3]	a. Rainbow trout and bluegill sunfish acute LC_{50} b. Rainbow trout early life stage NOAEC c. Daphnid acute EC_{50} d. Daphnid chronic reproduction NOAEC and LOAEC
Survival and reproduction of individuals and communities of **estuarine/marine fish** and **invertebrates**.	Peak EEC (acute), 21-day, and 60-day surface water EEC (chronic)[3]	a. Sheepshead minnow acute LC_{50} b. Sheepshead minnow chronic early life stage NOAEC and LOAEC c. Saltwater mysid acute LC_{50}, estuarine/marine mollusk EC_{50} based on shell deposition d. Saltwater mysid chronic reproduction NOAEC and LOAEC
Survival and reproduction of individuals and communities of freshwater and estuarine/marine **benthic** organisms.	21-day pore water and sediment EEC[3]	Freshwater midge sub-chronic NOAEC and LOAEC
Perpetuation of individuals and populations of non-target **terrestrial plant** species.	Estimates of runoff and spray drift to non-target areas	Monocot and dicot seedling emergence and vegetative vigor EC_{25} values
Maintenance and growth of individuals and populations of **aquatic vascular and non-vascular plants**	Peak surface water EEC	a. *Lemna gibba* EC_{50} values based on yield and growth rate. b. Algal EC_{50} values based on cell density, growth rate, and biomass

LD_{50} = Lethal dose to 50% of the test population; NOAEC = no-observed adverse effect concentration; LOAEC = lowest-observed adverse effect concentration; LC_{50} = lethal concentration to 50% of the test population; $EC_{50/25}$ = effect concentration to 50/25% of the test population.

[1]EFED risk assessment guidance, birds may be used as surrogates for terrestrial phase amphibians and reptiles.

[2]EFED risk assessment guidance, freshwater fish may be used as surrogates to aquatic phase amphibians.

[3]Based on a 1-in-10 year return frequency.

2.7.4. Measures of Risk

Risk characterization integrates exposure values (EECs) and toxicity estimates (typically, LC_{50}, LD_{50}, IC_{50}, IC_{25}, NOAEC) into a single value. This value is then compared to the relevant Agency Level of Concern (LOC) for exceedance. Where an exceedance occurs, the likelihood of adverse ecological effects to non-target species increases with the degree of exceedance.

3. EXPOSURE ASSESSMENT

3.1. Use Characterization

3.1.1. Use Information

There are four products containing florpyrauxifen-benzyl. **Table 4** summarizes the rice use information for all four florpyrauxifen-benzyl products. The use information for the other aquatic use patterns is summarized in **Table 5**, which applies only to the product GF-3301.

As shown in **Table 4**, two of the products have only florpyrauxifen-benzyl as the sole active ingredient, while two of the products are co-formulated with penoxsulam, and cyhalofop.

Table 4. Summary of Florpyrauxifen-benzyl Proposed Products/Labels – *Rice Use***

Product Name	GF-3206	GF-3301	GF-3480	GF-3565
A.I. by weight	2.7% florpyrauxifen-benzyl	26.5% florpyrauxifen-benzyl	2.13% florpyrauxifen-benzyl; 10.64% cyhalofop	1.3% florpyrauxifen-benzyl; 2.1% penoxsulam
A.I. by volume	0.21 lb a.i./gal florpyrauxifen-benzyl	2.50 lb a.i./gal florpyrauxifen-benzyl	0.17 lb a.i./gal florpyrauxifen-benzyl; 0.83 lb a.i./gal cyhalofop	0.10 lb a.i./gal florpyrauxifen-benzyl; 0.17 lb a.i./gal penoxsulam
Uses	For selective control of susceptible grass, sedge and broadleaf weeds in rice.			
Geographic Restrictions	AR; FL; LA; MS; MO; SC; TN; and TX			
Single Application Rate (based on florpyrauxifen-benzyl)	0.0099-0.0263 lb a.i./A[1]	0.0098-0.0268 lb a.i./A[1]	0.0272 lb a.i./A	0.0214 lb a.i./A
Max. No. of Apps	2		1	
Int. between Apps (days)	14		Not Applicable	
Maximum Application Rate per season or year	0.0526 lb a.i./A	0.0536 lb a.i./A	0.0272 lb a.i./A	0.0214 lb a.i./A
Timing of App	From 2 leaf stage (drill-seeded rice or water-seeded rice) with no exposed roots up to 60 days before harvest.			
Pre-harvest Interval (days)	60			

**Not for use on wild rice.

[1] Rate depends on weed controlled.

Based on its label, the aquatics uses for the product GF-3301, are for the "management of freshwater aquatic vegetation in ponds, lakes, reservoirs, marshes, wetlands, bayous, drainage ditches, canals, and other aquatic sites, including vegetation control on shoreline and riparian areas within or adjacent to these sites." The label says that, "GF-3301 has relatively short exposure requirements for in-water treatments (hours to days), but treatments with high exchange and short exposure periods should be carefully planned to achieve best results."

Table 5. Summary of Florpyrauxifen-benzyl Proposed Product – *Aquatics Use*

Product Name	GF-3301	
A.I. by weight	26.5% florpyrauxifen-benzyl	
A.I. by volume	2.50 lb a.i./gal florpyrauxifen-benzyl	
Uses	Aquatics, for management of freshwater aquatic vegetation.	
Geographic Restrictions	Ponds, lakes, reservoirs, marshes, wetlands, bayous, drainage ditches, canals, and other aquatic sites (freshwater aquatic vegetation)	
Type of Application	Direct application to water (subsurface injection, or low pressure coarse stream applied to the surface from the shoreline or may require a boat, depending on the water body size[1])	Foliar applications or foliar spot treatments: by boat or with ground or aerial equipment
Single Application Rate	10-150 ppb; 50 ppb or less, typical rate[2]	0.0273-0.0527 lb a.i./A
Max. No. of Apps	1 at maximum rate	2 at maximum rate
Int. between Apps (days)	10 days, if less than the maximum rate is used	Not specified, assumed 10 days, consistent with the in-water applications
Maximum Application Rate per Year	150 ppb/year	0.105 lb a.i./A/year
Timing of App	"For best results, apply GF-3301 to actively growing plants. However, effective control can be achieved over a broad range of growth stages and environmental conditions." "GF-3301 performance and selectivity depends on dosage, time of year, stage of growth, method of application, and water movement."	

[1] The methods of application are based on additional supplemental information supplied by the applicant.
[2] The typical application rate is based upon information provided in the label (≤50 ppb).

3.1.2. Environmental Hazards Statements

The following Environmental Hazards statements appear in the Sub-label A for GF-3301, for the agricultural uses of florpyrauxifen-benzyl (*i.e.*, rice) ***and*** in the Sub-Label B for GF-3301, for the aquatics uses; additionally, it appears in the labels for GF-3206, and GF-3565, for the rice use:

> *For terrestrial uses: Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark except when treating rice fields as specified in this product label. Drift and runoff from ground or aerial applications is likely to result in damage to sensitive aquatic organisms in water bodies adjacent to the treatment area. Do not contaminate water when disposing of equipment wash waters or rinsate.*

The following additional Environmental Hazards statements appear only in the Sub-label A for GF-3301, for the agricultural uses (*i.e.*, rice) ***and*** in the Sub-Label B for GF-3301, for the aquatics uses (however, they do not appear in the labels for GF-3206, and GF-3565):

> ***Aquatic Weed Control:*** *Treatment of aquatic weeds can result in oxygen loss from decomposition of dead weeds. This loss can cause fish suffocation. Therefore, to minimize this hazard, treat ⅓ to ½ of the water area in a single operation and wait at least 10 to 14 days*

between treatments along the shore and proceed outwards in bands[7] *to allow fish to move into untreated areas. Consult with the State agency with primary responsibility for regulating pesticides before applying to public waters to determine if a permit is needed.*

The following Environmental Hazards statements appear only in the label for GF-3480, for the agricultural uses (*i.e.*, rice). It appears that the additional language in this label is due to the additional active ingredient in the product, cyhalofop:

This product is toxic to fish and aquatic invertebrates. For terrestrial uses: Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark except when treating rice fields as specified in this product label. Drift and runoff from ground or aerial applications is likely to result in damage to sensitive aquatic organisms in water bodies adjacent to the treatment area. Do not contaminate water when disposing of equipment wash waters or rinsate.

Groundwater: *This chemical demonstrates the properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.*

The products GF-3301 and 3206 do not provide residual weed control. The use of an agriculturally approved methylated seed oil (MSO) adjuvant is recommended for GF-3301 and GF-3206. The GF-3480 and GF-3562 formulations have adjuvant built-in. GF-3301, GF-3206, GF-3480, and GF-3565 can be tank mixed with a number of other herbicides as listed in each label. The most restrictive instructions of tank mixed products should be followed.

The products GF-3301, GF-3206, GF-3480, and GF-3565 are not for use on wild rice. For the rice use (all products), the minimum spray volume is 10 gallons per acre (gpa) for both aerial and ground applications. Applications at wind speeds below 2 mph should be avoided (it is stated that drift potential is lowest at wind speeds of 2-10 mph). These products should not by applied under conditions of a low level air temperature inversion. Further, it is instructed to use coarse droplet category per S- 572 ASABE standard at spray boom pressure no greater than 30 psi for aerial applications, in order to minimize spray drift. For the aerial applications, the boom height should not be greater than 10 feet above the top of the largest plants, unless a greater height is required for aircraft safety. For ground applications, the use of coarse or coarser nozzle spray quality per S-572 ASABE standard is instructed.

Florpyrauxifen-benzyl in these products can be applied pre-flood and post-flood. For post-flood applications, the flood water should be lowered to expose at least 70% of the weed foliage (e.g., 1

[7] Note that there is no further description of the band treatments in the label.

to 2 inches deep). Normal flood should be re-established, beginning within 3 hours after application, preventing germination of new weeds. Per the labels, establishing permanent flood <5 days after application of product can benefit weed control. According to the labels, all four products GF-3301, GF-3206, GF-3480 and GF-3565 are rain-fast in 2 hours. Resistance management language is also added to the labels, and the products should be used as part of an Integrated Pest Management (IPM) programs.

For the aquatics uses of GF-3301, a permit is required prior to chemical application. There are certain restrictions for using treated water for irrigation. For the in-water applications (to submersed or floating aquatic weeds), the product can be applied undiluted, or diluted with water. For post-emergent foliar applications (to floating and emergent weeds), an approved surfactant for aquatics uses should be used and product should be diluted with water to achieve proper coverage of treated plants. Spray volumes up to 100 gpa are recommended for the ground foliar applications. A coarse or coarser nozzle spray quality per S-572 ASABE standard is recommended. For spot treatments, product should be diluted 0.01 to 0.02% GF-3301 plus an adjuvant added. Spray coverage should be sufficient to moisten the leaves of the target vegetation but not to the point of runoff. For the aerial foliar applications, the spray volume should be 15 gpa or more and a coarse droplet category per S-572 ASABE standard should be used. According to the label, GF-3301 may be mixed with other herbicides or algaecides registered for aquatic use (unless specifically prohibited by the label).

3.1.3. Use Precautions and Use Restrictions

Among others, the following use precaution is stated in the label for GF-3301:

> **Obtain Required Permits:** Consult with appropriate state or local water authorities before applying this product to public waters. State or local public agencies may require permits.

Among others, the following use restriction is stated in the label for GF-3301:

> **Chemigation:** Do not apply this product through any type of irrigation system.

3.1.4. Usage Information, Rice Production in the U.S.

According to the Agricultural Marketing Resource Center, "U.S. production accounts for less than 2 percent of the world total; however, the country is an important exporter due to the relatively small percentage of rice traded globally. In recent years, about half of U.S. production has been exported."[8] Further, it is stated that, "In the United States, rice production is predominant in three areas of the country—the Mississippi Delta region, the Gulf Coast and the Sacramento Valley

[8] URL: http://www.agmrc.org/commodities-products/grains-oilseeds/rice-profile/ (accessed 10/12/2016).

region of California. Of these regions, the Mississippi Delta is the largest in terms of total acreage; however, the Sacramento Valley historically has produced the highest yields. In terms of states, six produce nearly all rice grown in the United States: Arkansas, California, Louisiana, Mississippi, Missouri and Texas." The following graph from the USDA National Agricultural Statistics Service illustrates the acreage of rice planted in the U.S. The lowest point was around 2.35 million acres in 2013. The highest point was in 2010 with around 3.60 million acres. In 2016 was 3.18 million acres (**Figure 4**). It should be noted that the proposed use of florpyrauxifen-benzyl on rice does not include California.

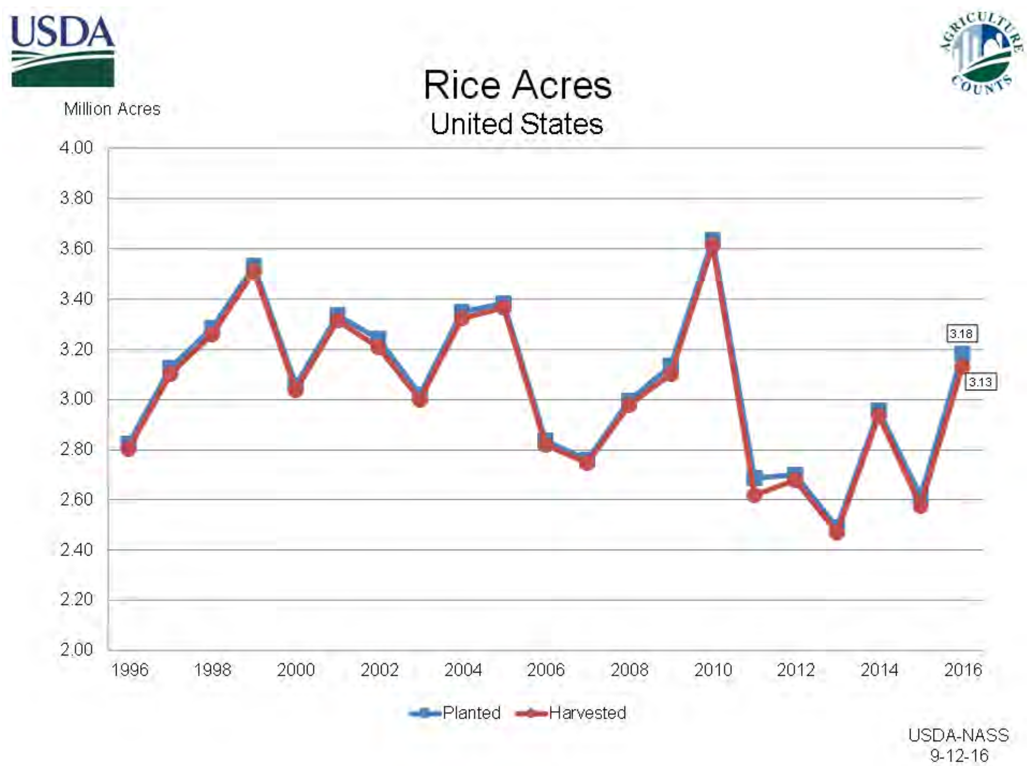


Figure 4. Rice acres planted and harvested in the U.S. from 1996 to 2016[9]

Figure 5 shows the rice production sites in the U.S., based on 2016 production. As shown in the map, the region of interest covers the southeast of Texas and parts of the Mississippi Delta, plus, per the label, the southeast of the U.S. (*e.g.*, Florida and South Carolina). The figure was created in a USDA website, using an interactive map.[10] At this time, the rice regions in California are not considered of interest, since the labels do not include that state.

[9] URL: https://www.nass.usda.gov/Charts_and_Maps/Field_Crops/riceac.php (accessed 10/12/2016).
[10] URL: http://prodwebnlb.rma.usda.gov/apps/MapViewer/index.html (accessed 11/01/2016).

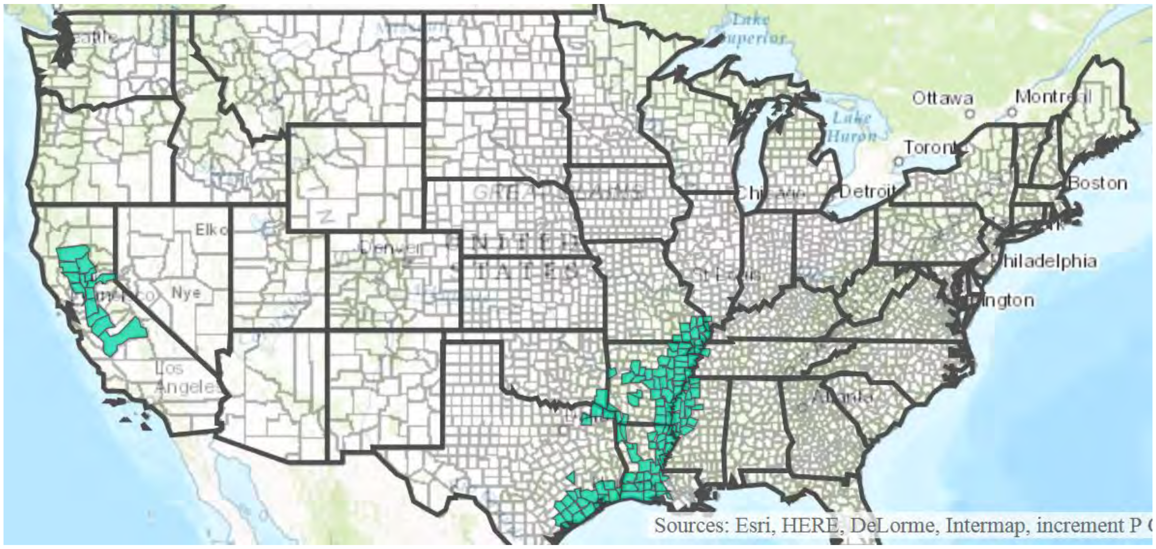


Figure 5. Rice production areas as of 2016, in the U.S.
(for details, refer to text above)

3.1.5. Other Aquatic Uses

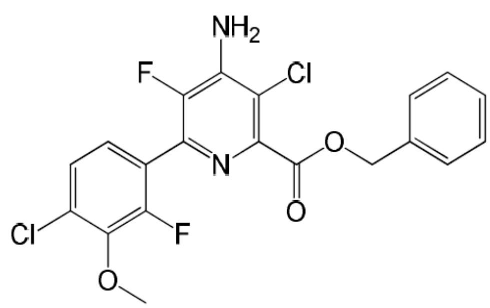
According to the submitted labels, there are no specific geographic limitations in the use of florpyrauxifen-benzyl in aquatic use sites, with the exception that it is to be used to control "freshwater aquatic vegetation." According to the label, GF-3301 is "[a] selective systemic herbicide for management of freshwater aquatic vegetation in ponds, lakes, reservoirs, marshes, wetlands, bayous, drainage ditches, canals, and other aquatic sites, including vegetation control on shoreline and riparian areas within or adjacent to these sites." Therefore, it appears that florpyrauxifen-benzyl has the potential to be used in freshwater bodies of water all across the U.S. Exposure to saltwater bodies of water is possible when the applications occur to flowing freshwaters, due to possible persistence of the stressors (total toxic residues, see the next **Section 3.2**).

3.2. Environmental Fate and Transport Characterization

3.2.1. Physicochemical Properties

Table 6 gives a summary of physicochemical properties of florpyrauxifen-benzyl [CAS No. 1390661-72-9; CAS Name 2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-5-fluoro-, phenylmethyl ester; IUPAC Name Benzyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carboxylate]. Florpyrauxifen-benzyl shows a relatively high molecular weight of 439.2 g/mole and a relatively low solubility in water of 0.015 mg/L. Based on its vapor pressure, it is considered 'non-volatile under field condition'. The K_{AW} (which is a function of the Henry's Law Constant) predicts that the chemical is 'slightly volatile from a water surface.' However, based on the $C_{water+soil}/C_{air}$, the chemical is classified as 'non-volatile from a moist soil' (for reference to classification scheme, refer to the footnote to **Table 6**). Based solely on its octanol/water partition coefficient (at pH 7, $\log_{10} P_{OW} = 5.5$), florpyrauxifen-benzyl would be predicted to bioconcentrate in fish tissue, although the Fish BCF study shows that the chemical residues do not bioconcentrate as much as would be expected, suggesting possible degradation and/or metabolism in fish tissue (see more below).

Table 6. Physical-chemical Properties of Florpyrauxifen-benzyl (XDE-848 Benzyl Ester)

Property	Value and units	MRID or Source
Molecular Weight	439.2 g/mole	49677702
Chemical Formula	$C_{20}H_{14}Cl_2F_2N_2O_3$	49677702
CAS No.	1390661-72-9	49677702
CAS Chemical Name	2-pyridinecarboxylic acid, 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-5-fluoro-, phenylmethyl ester	49677702
IUPAC Chemical Name	Benzyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoropyridine-2-carboxylate	49677711
Synonyms	Florpyrauxifen-benzyl, Rinskor™, XDE-848 Benzyl Ester, XDE-848 BE, XR-848-BE, XR-848 Benzyl, X11959130, TSN301734	Label and various other laboratory fate studies
Structure		49677702
Physical State	Powder (as manufactured) @ 21.3°C	49677702, DP Barcode 430020
Relative/Bulk/Tap Density	Relative density 1.39 Bulk Density 0.202 g/mL at 23.4°C Tap Density 0.320 g/mL at 23.4°C	49677702, DP Barcode 430020
Vapor Pressure	4.6×10^{-5} Pa (3.5×10^{-7} torr) at 25°C 3.2×10^{-5} Pa (2.4×10^{-7} torr) at 20°C Classified as 'Non-volatile under field conditions.' (1)(3)	49677702, DP Barcode 430020
Henry's Law Constant	9.2×10^{-6} atm-m^3/mole at 20°C --- 1.3×10^{-5} atm-m^3/mole (using VP at 25°C and S at 20°C)	Estimated from water solubility and vapor pressure
Water Solubility	Purified Water: 0.015 mg/L at 20°C pH 5 buffer solution: 0.014 mg/L pH 7 buffer solution: 0.011 mg/L pH 9 buffer solution: 0.012 mg/L	49677702, DP Barcode 430020

Property	Value and units	MRID or Source
Solubility in Organic Solvents	All at 20°C: methanol 13 g/L acetone 210 g/L xylene 14 g/L 1,2-dichloroethane 95 g/L ethyl acetate 120 g/L n-heptane 0.053 g/L n-octanol 4.9 g/L	49677702, DP Barcode 430020
Octanol – water partition coefficient (K_{OW})	pH 5: $\log_{10} P_{OW} = 5.4 \pm 0.1$ at 20°C pH 7: $\log_{10} P_{OW} = 5.5 \pm 0.04$ at 20°C pH 9: $\log_{10} P_{OW} = 5.5 \pm 0.1$ at 20°C	49677702, DP Barcode 430020
Air-water partition coefficient (K_{AW})	$K_{AW} = C_{air}/C_{water} =$ HLC/(RT) = 3.84×10^{-4} (unit-less) at 20°C Classified as 'Slightly volatile from a water surface.' (1)	Calculated HLC = Henry's Law Constant
Octanol-air partition coefficient (K_{OA})	$K_{OA} = K_{OW}/K_{AW} = 8.2 \times 10^{8}$ (unit-less)	Calculated
$C_{water+soil}/C_{air}$	$C_{water+soil}/C_{air} = (C_{water}/C_{air})(1/r + K_d) =$ $(2604)(1/6 + 796.5) = 2.07 \times 10^{6}$ (3) Classified as 'Non-volatile from a moist soil.' (1)(2)(3)	Calculated
Dissociation Constant	Does not dissociate in the environmental pH range (pH 4 to 10)	49677702, DP Barcode 430020
pH	6.58 at 23.4 °C (1% dilution in water)	49677702, DP Barcode 430020
UV/Visible light absorption	Acidic: λ max at 212, 245 nm Neutral: λ max at 212, 245 nm Alkaline: λ max at 217, 241 nm	49677702, DP Barcode 430020

(1) For classification scheme, see "Guidance for Reporting on the Environmental Fate and Transport of the Stressors of Concern in Problem Formulations," available at the following URL: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/guidance-reporting-environmental-fate-and-transport (accessed 10/14/2016).

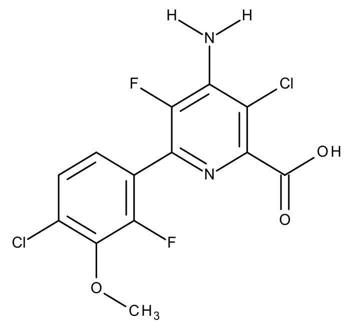
(2) Assuming 2% organic carbon, soil to soil water ratio (w/w) = 6, and soil water to soil air (v/v) = 1.

(3) Note that all chemicals may volatilize to some extent; this classification simply indicates that the volatility potential is very low.

In addition, **Table 7** shows some of the physicochemical properties of XDE-848 acid, one of the major degradates of florpyrauxifen-benzyl. As shown in the table, the acid is more soluble than the parent, and less volatile. It should be noted that EPI Suite v.4.11 predicted a K_{OC} range of 101-675 mL/g_{OC} and it says that the K_{OC} is dependent on the pH of the system, which is expected for an acid.

Table 7. Physical-chemical Properties of XDE-848 Acid

Property	Value and units	Source
Molecular Weight	349.12 g/mole	EPI Suite v.4.11 Estimate
Chemical Formula	$C_{13}H_8Cl_2F_2N_2O_3$	Based on structure
IUPAC Chemical Name	4-Amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carboxylic acid	--
Synonyms	X11438848, TSN304667, TSN301691, 1552-A	Various fate studies
SMILES Code	[H]N([H])c1c(c(nc(c1Cl)C(=O)O)c2ccc(c(c2F)OC)Cl)F	Based on structure

Property	Value and units	Source
Structure		Various fate studies
Melting and Boiling Point	Melting point 199°C Boiling point 471°C	EPI Suite v.4.11 Estimate
Vapor Pressure	The vapor pressure of XDE 848 acid was found to be 3 x 10^{-8} Pa at 25°C and 1 x 10^{-8} Pa at 20°C.	MRID 50155504
	2.17 x 10^{-9} torr at 25°C Classified as 'Non-volatile under field conditions' (1)(2)	EPI Suite v.4.11 Estimate
Henry's Law Constant	1.70 x 10^{-16} atm-m^3/mole at 25°C	EPI Suite v.4.11 Estimate
Water Solubility	The following solubility values were determined for XDE-848 Acid at 20°C: Purified water: 132 mg/L pH 5 buffer solution: 330 mg/L pH 7 buffer solution: > 250 g/L pH 9 buffer solution: > 250 g/L	MRID 50155502
	18.6 mg/L at 25°C (from estimated K_{OW}) 645.6 mg/L at 25°C (from fragments)	EPI Suite v.4.11 Estimate
Octanol – water partition coefficient (K_{OW})	The following values for the octanol/water partition coefficient, Pow, of XDE-848 acid were determined: pH 5 buffer solution: 2.64 ± 0.08 (log Pow = 0.42 ± 0.01) pH 7 buffer solution: 0.162 ± 0.021 (log Pow = -0.79 ± 0.06) pH 9 buffer solution: 0.117 ± 0.005 (log Pow = -0.93 ± 0.02)	MRID 50155501
	log K_{OW} = 2.96	EPI Suite v.4.11 Estimate
Air-water partition coefficient (K_{AW})	$K_{AW} = C_{air}/C_{water}$ = 6.95 x 10^{-15} (unitless) Classified as 'Non-volatile' (1)(2)	EPI Suite v.4.11 Estimate
Octanol-air partition coefficient (K_{OA})	K_{OA} = 1.31 x 10^{17} (unitless)	EPI Suite v.4.11 Estimate
$C_{water+soil}/C_{air}$	$C_{water+soil}/C_{air} = (C_{water}/C_{air})(1/r + K_d)$ = (1.44 x 10^{14}) (1/6 + 1.33) = 2.16 x 10^{14} Classified as 'Non-volatile from a moist soil' (1)(2)	Calculated, using the measured mean K_d from **Table 3.7**

(1) For classification scheme, see "Guidance for Reporting on the Environmental Fate and Transport of the Stressors of Concern in Problem Formulations," available at the following URL: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/guidance-reporting-environmental-fate-and-transport (accessed 10/14/2016).

(2) Note that all chemicals may volatilize to some extent; this classification simply indicates that the volatility potential is very low.

3.2.2. Environmental Fate

Table 8 provides a summary of environmental fate properties of the chemical, along with fate information about its transformation products and/or the total toxic residues (for further information about the selection of the chemicals included in the TTRs, refer to **Section 3.3**).

Florpyrauxifen-benzyl degradation is dependent on the environmental conditions, and it degrades from rapidly, to slowly, to relatively stable in different environments; further, it yields several degradates. The total toxic residues (*i.e.*, parent plus degradates deemed to be of concern for aquatic plants or TTRs, see **Section 3.3**) are much more persistent than the parent alone. Major degradates differ when the test substance is exposed to light, compared to water, or soil/sediment metabolism studies. Levels of unextracted radioactivity were high in most of the metabolism studies; however, a supplemental study indicated that this radioactivity was unextractable. In the field, it appears that a combination of routes of dissipation takes place.

Florpyrauxifen-benzyl is an ester compound and as such degrades to an acid, especially in high pH environments and/or by metabolism mediated hydrolysis. Two other degradates of florpyrauxifen-benzyl are also ester compounds that also hydrolyze: In aquatic and soil systems, the parent compound hydrolyzes to XDE-848 acid, which is a major degradate and is phytotoxic. Alternatively, it undergoes demethylation of the methoxy moiety, to yield XDE-848 benzyl hydroxy, which is also phytotoxic, and subsequently hydrolyzes/metabolizes to XDE-848 hydroxy acid. Under the influence of light in clear shallow water, florpyrauxifen-benzyl rapidly undergoes dechlorination of the chloride moiety in the pyridine ring to yield des-chloro XDE-848 benzyl ester, which hydrolyzes to des-chloro XDE-848 acid. Other degradates, like nitro hydroxy acid was observed only in a few instances in the laboratory studies. Benzyl alcohol and benzoic acid were not considered of ecological concern. Ultimately, the test substance mineralizes or binds to the soil or sediment. Three of these degradates were considered stressors of concern for ecological exposure to plants, along with the parent compound, and were included in the expression of the total toxic residues. Only the parent compound is considered a stressor of concern to aquatic animals.

Table 8. Environmental Fate Properties for Florpyrauxifen-benzyl (XDE-848 Benzyl Ester)

Study	Value and Unit	Major Degradates* *Minor Degradates**	MRID/ Citation	Classification, Comments
Abiotic Hydrolysis	XDE-848 BE SFO $t_{1/2}$ at 25°C = pH 4 = Stable **pH 7 = 111 days** pH 9 = 1.23 days **XDE-848 acid was stable** at pH's of 4, 7 and 9, in analyses conducted for 5 days at 50°C.	At pH 7: **Major:** XDE-848 acid; Benzyl alcohol	49677711	Acceptable; Additional studies were conducted for XDE-848 BE at 10°C, 35°C and 50°C, but they are not reported in this table.

Study	Value and Unit	**Major Degradates*** ***Minor Degradates****	MRID/ Citation	Classification, Comments
	TTR = parent + XDE-848 acid at 25°C and at **pH 7 relatively stable t_{input} = 0 (stable)**			TTRs ranged from 98.8-100.0% initially and 99.2-100.1% at 30 days, indicating TTRs are stable.
Atmospheric Degradation	XDE-848 BE half-life = 1.12 days, estimated for OH radical reaction; No ozone reaction estimation.	Not Available	49677713 EPI Suite v.4.11 estimate AOPWIN v.1.92	Supplemental; Hydroxyl radical reaction assumptions at 25°C and 12-hr day; $1.5x10^6$ OH/cm^3
Direct Aqueous Photolysis	*pH 4 buffered solution:* Corrected to natural summer sunlight (40°N) environmental photolysis SFO half-life = **XDE-848 BE $t_{1/2}$ = 0.0786 days**; (For the TTRs, the half-life is the same than for the parent alone, since the degradates of concern were not present in this study: **TTRs $t_{1/2}$ = 0.0786 days**)	**Major:** Des-chloro XDE-848 acid; Des-chloro XDE-848 benzyl ester; Benzyl alcohol ***Minor*:** X12421263	49677712	Supplemental; In pH 4 buffer: XDE-848 Benzyl Ester was stable in the dark control.
	Natural water: Environmental photolysis SFO half-life, corrected to natural summer sunlight (40°N) = **XDE-848 BE $t_{1/2}$ = 0.161 days**	**Major:** Des-chloro XDE-848 benzyl ester; Benzyl alcohol ***Minor*:** Des-chloro XDE-848 acid; XDE-848 acid		In natural water: XDE-848 Benzyl Ester shows an uncorrected SFO DT_{50} = 5.87 days in the dark controls. XDE-848 acid was higher in the dark control than in the irradiated samples (*i.e.*, not considered a phototransformation product).
	For the TTRs = parent + XDE-848 acid, the environmental photolysis SFO half-life, corrected to natural summer sunlight (40°N) = **TTRs $t_{1/2}$ = 0.199 days**	A day of irradiation with the artificial lamp was equivalent to 1.62 days of summer sunlight at 40°N latitude, the environmental phototransformation $t_{1/2}$ is 0.199 days.		Irradiated samples, SFO $t_{1/2}$ = 0.123 days; the dark control samples were relatively stable (calculated $t_{1/2}$ = 12,613 days).
Soil Photodegradation	Natural summer sunlight (40°N) SFO environmental half-life = XDE-848 BE $t_{1/2}$ = 50 days, German loam (Speyer 2.4) The degradation appeared to slow down with time.	***Minor*:** Des-chloro XDE-848 Benzyl Ester; Des-chloro XDE-848 acid; XDE-848 acid	49677714	Supplemental; The preferred kinetics model from PestDF is DFOP instead of SFO. The uncorrected DFOP slow half-life is 46.3 days.

Study	Value and Unit	Major Degradates* *Minor Degradates**	MRID/ Citation	Classification, Comments
Aerobic Soil Metabolism (20°C)	XDE-848 BE half-life = 67.2 days (SFO[1]), Yolo loam soil (CA), pH 7.2; 32.4 days (SFO[1]), loam (Germany), pH 6.2; 34 days (IORE), silt loam (UK), pH 5.9; 8.91 days (IORE), loamy sand (UK), pH 7.4; *and,* 182 days (IORE), *sterile* (via gamma irradiation) sandy loam (UK); 90^{th} percentile confidence bound on the mean half-life value **t_{input} = 55.3 days**	**Major:** XDE-848 acid; Nitro hydroxy acid; ***Minor*:** XDE-848 hydroxy acid; XDE-848 benzyl hydroxy	49677715	Supplemental; Estimated SFO half-lives for XR-848 acid: 64.1 days; 57.9 days; 121 days; 40.8 days; For the parent[2]: Mean = 35.628 days; Std. Dev. = 23.970 days; $t_{90,n-1}$ = 1.638 (n = 4)
	TTRs = parent + XDE-848 acid + XDE-848 hydroxy acid + XDE-848 benzyl hydroxy half-life = 154 days (SFO); 65.6 days (SFO[1]); 234 days (IORE); 41 days (SFO); 90^{th} percentile confidence bound on the mean half-life value **t_{input} = 196 days**			For the TTRs[2]: Mean = 123.65 days; Std. Dev. = 88.127 days; $t_{90,n-1}$ = 1.638 (n = 4)
Aerobic Soil Metabolism (Flooded System) (20°C)	XDE-848 BE half-life = 31.3 days (IORE), loam (Italy), soil pH 4.9; 11.6 days (IORE), sandy loam (Italy), soil pH 4.5; 90^{th} percentile confidence bound on the mean half-life value: **t_{input} = 44.6 days**	**Major:** XR-848 hydroxy acid; XR-848 acid; XR-848 benzyl hydroxy	49677716	Supplemental; Estimated SFO half-lives: XR-848 hydroxy acid: 127 and 729 days; XR-848 acid: 14 days; XR-848 benzyl hydroxy: 86.9 days; For the parent[2]: Mean = 21.45 days; Std. Dev. = 13.93 days $t_{90,n-1}$ = 3.078 (for n=2)
	TTRs = parent + XR-848 hydroxy acid + XR-848 acid + XR-848 benzyl hydroxy half-life = 165 days (DFOP); 960 days (DFOP); 90^{th} percentile confidence bound on the mean half-life value: **t_{input} = 1,787 days**			For the TTRs[2]: Mean = 562.50 days; Std. Dev. = 562.15 days $t_{90,n-1}$ = 3.078 (for n=2)

Study	Value and Unit	Major Degradates* *Minor Degradates**	MRID/ Citation	Classification, Comments
Anaerobic Soil Metabolism (Flooded) (20°C)	XDE-848 BE half-life = 37.6 days (IORE), Yolo clay loam (CA), pH 7.3; 14.8 days (IORE), loam (Germany), pH 6.0; 16.9 days (IORE), silt loam (UK), pH 5.5; 46.2 days (IORE), Site I2 sandy loam (UK), pH 7.5; 90th percentile confidence bound on the mean half-life value = **t_{input} = 41.5 days**	**Major:** XR-848 hydroxy acid; XR-848 acid	49677718	Supplemental; For the parent[2]: Mean = 28.88 days; Std. Dev. = 15.47 days $t_{90,n-1}$ = 1.638 (n = 4)
	TTRs = parent + XR-848 hydroxy acid + XR-848 acid half-life = 1,336 days (SFO); 2,682 days (SFO); 417 days (SFO); Stable**; 90th percentile confidence bound on the mean half-life value = **t_{input} = 7,181 days** (indicates high persistence); **For the sandy loam, assumed t_R = 10,000 days (for this soil TTRs increased slightly with time).			For the TTRs[2]: Mean = 3609 days; Std. Dev. = 4361 days $t_{90,n-1}$ = 1.638 (n = 4)
Aerobic Aquatic Metabolism (20°C)	XDE-848 BE half-life = 4.04 days (SFO), loam sediment (France), water pH 7.8, sediment pH 7.1; 6.16 days (SFO), loamy sand sediment (England), water pH 6.6, sediment pH 6.2; 90th percentile confidence bound on the mean half-life value: **t_{input} = 8.36 days** at 20°C.	**Major:** XR-848 hydroxy acid; XR-848 acid; XR-848 benzyl hydroxy; Benzoic acid	49677719	Supplemental; Estimated SFO half-lives: XR-848 Hydroxy acid: 121 and 52.5 days; XR-848 acid: 6.32 and 18 days; XR-848 benzyl hydroxy: 5.65 and 14 days; For the parent[2]: Mean = 5.10 days; Std. Dev. = 1.50 days; $t_{90,n-1}$ = 3.078 (for n=2)
	TTRs = parent + XR-848 hydroxy acid + XR-848 acid + XR-848 benzyl hydroxy half-life = 113 days (DFOP); 98.9 days (SFO); 90th percentile confidence bound on the mean half-life value: **t_{input} = 128 days** at 20°C.			For the TTRs[2]: Mean = 105.95 days; Std. Dev. = 9.97 days; $t_{90,n-1}$ = 3.078 (for n=2)

Study	Value and Unit	Major Degradates* *Minor Degradates**	MRID/ Citation	Classification, Comments
Anaerobic Aquatic Metabolism (20°C)	XDE-848 BE half-life = 2.37 days (SFO), loamy sand sediment (Switzerland), water pH 8.14, sediment pH 7.35; 2.1 days (SFO), silt loam sediment (Switzerland), water pH 7.42, sediment pH 7.15; 90th percentile confidence bound on the mean half-life value: **t_{input} = 2.65 days**	**Major:** XDE-848 hydroxy acid; XDE-848 acid; XDE-848 benzyl hydroxy; Benzoic acid ***Minor:*** Benzyl alcohol	49677720	Supplemental; XDE-848 hydroxy acid was the terminal degradate; For the parent[2]: Mean = 2.235 days; Std. Dev. = 0.191 days $t_{90,n-1}$ = 3.078 (for n=2)
	TTRs = parent + XDE-848 hydroxy acid + XDE-848 acid + XDE-848 benzyl hydroxy = 16734 days (SFO); 965 days (SFO); 90th percentile confidence bound on the mean half-life value: **t_{input} = 33,118 days** (persistent)			For the TTRs[2]: Mean = 8,850 days; Std. Dev. = 11,150 days $t_{90,n-1}$ = 3.078 (for n=2)
Mobility/ Batch Equilibrium K_d, K_{OC}, K_F, K_{FOC}, for the parent XDE-848 BE	See **Tables 9 to 10** for additional details. XDE-848 BE mean **K_{OC} = 32,280 L/kg$_{OC}$** (hardly mobile, based on FAO 2000)	N/A	49677710	Supplemental
Mobility/ Batch Equilibrium K_d, K_{OC}, K_F, K_{FOC}, for three degradates	See **Tables 11 to 13** for additional details. XDE-848 Acid mean **K_{OC} = 71.8 L/kg$_{OC}$** (mobile, based on FAO 2000); XDE-848 Hydroxy Acid mean **K_d = 1.91 L/kg**; XDE-848 hydroxy benzyl ester mean **K_d = 118 L/kg**.	N/A	49677709	Supplemental; For XDE-848 Acid the K_{OC} model represents the mobility better than the K_d model.

Study	Value and Unit	Major Degradates* *Minor Degradates**	MRID/ Citation	Classification, Comments
Aquatic Field Dissipation (Rice use)	XDE-848 BE dissipation half-life[3]= Range of values provided for two applications. <u>CA clay loam EC formulation</u>: Water: 0.159-0.199 days (SFO); Soil: 1.45 days (SFO); 22.6 days (IORE); <u>CA clay loam GR formulation</u>: Water: 0.15-0.343 days (SFO); Soil: 17, 24.2 days (DFOP); <u>TX sandy loam</u>: Water: N/A, 0.791 days (SFO); Soil: 8.11 days (SFO), ND	**Major:** XDE-848 acid; XDE-848 hydroxy acid; XDE-848 benzyl hydroxy (benzyl hydroxy was major only for the granular formulation applications). ***Minor***: Des-chloro XDE-848 BE; Des-chloro XDE-848 acid	49677721	Supplemental; Currently, the applicant is not seeking registration for any granular formulated product containing florpyrauxifen-benzyl.
Aquatic Field Dissipation (Aquatics use)	XDE-848 BE dissipation half-life[3]= Water half-lives: Two sites at 50 ppb: FL site $t_{1/2}$ = 1.4 days (SFO); NC site $t_{1/2}$ = 2.3 days (SFO); One site at 150 ppb: FL site $t_{1/2}$ = 6.4 days (SFO) Sediment half-lives could not be calculated.	**Major:*** XDE-848 acid – 35.2% (22 days) ***Minor:**** XDE-848 benzyl hydroxy – 1.0% (22 and 28 days) XDE-848 hydroxy acid – 4.7% (22 days) Des-chloro XDE-848 benzyl ester – 0.2% (0.5, 1.5 and 2 days) Des-chloro XDE-848 acid – 0.2% (7, 14 and 22 days)	49677722 & 49677723	Both studies are supplemental; *Maximum percentages are based on the study conducted at 150 ppb, in FL.
Bioconcentration Factor (BCF) – Bluegill Sunfish (*Lepomis macrochirus*) (22°C)	Maximum steady state BCF obtained at the highest concentration, and *based on TRR*: 356 L/kg wet wt whole fish; 55 L/kg wet wt edible tissue; 686 L/kg wet wt non-edible tissue; Depuration $t_{1/2}$ = 0.2-0.4 days	**Major:** XDE-848 acid; Taurine conjugate of XDE-848 acid; ***Minor:*** Deschloro-XDE-848 acid; Other degradates ≤1.2% of total residue recovered (TRR)	49677749	Supplemental

Abbreviations: ND = not determined; N/A = not applicable.

TTR = total toxic residues = parent florpyrauxifen-benzyl for aquatic animals; and parent + XDE-848 acid + XDE-848 hydroxy acid + XDE-848 benzyl hydroxyl for aquatic plants. For structures, refer to the **Figure 6**.

(1) In the aerobic soil metabolism study, PestDF selected DFOP kinetics for the t_{rep} for the Yolo loam (348 days) and the Germany loam (129 days). It was found however, that when the TTR were calculated, the t_{rep} was lower than for the parent alone. Given there is uncertainty in these measurements, the same kinetics model was used to represent parent alone and the TTRs (*i.e.*, SFO), and those results were used in calculating the t_{input} half-life for the aerobic soil metabolism.

(2) 90[th] percentile confidence bound on the mean calculated using the following equation:

Study	Value and Unit	Major Degradates* *Minor Degradates*	MRID/ Citation	Classification, Comments

$$t_{input} = \overline{t_{1/2}} + \frac{t_{90,n-1}s}{\sqrt{n}}$$

(3) These half-lives may reflect both dissipation and degradation processes.

3.2.3. Degradation

The hydrolytic behavior of florpyrauxifen-benzyl is characterized by its ester moiety. It hydrolyzes faster at higher pH values and with a half-life of 111 days at pH 7 and 25°C (stable at pH 4, and 1.23 days at pH 9). The major products of hydrolysis were XDE-848 acid and benzyl alcohol. XDE-848 acid was formed nearly quantitatively at pH 9 (*i.e.*, it was the terminal degradate at 96.5-97.8% of the applied radioactivity).

In pH 4 buffered solution, florpyrauxifen-benzyl photolyzed rapidly, with a half-life of only 0.0786 days, with the formation of the following major degradates: des-chloro XDE-848 acid, des-chloro XDE-848 benzyl ester and benzyl alcohol. These dechlorinated degradates were solely the product of aqueous photolysis and, as will be described later, were minor products in the field. In natural water, the parent compound also photolyzed rapidly with a half-life of 0.16 days. The degradate profile was somewhat similar to that of the pH 4 part of the study, with the additional formation of XDE-848 acid in minor amounts.

On a German loam soil, florpyrauxifen-benzyl degraded with a corrected SFO half-life of 50 days. Minor degradates observed in the study included, des-chloro XDE-848 benzyl ester, des-chloro XDE-848 acid and XDE-848 acid.

The estimated atmospheric degradation half-life was estimated to be ~1.1 days, due to hydroxyl radical reaction, based on EPI Suite modeling (v.4.11 estimate AOPWIN v.1.92). There was no ozone reaction estimate.

For the ecological risk assessment, the total toxic residues (TTRs) of ecological concern to plants were defined by the following expression (for a justification of the definition, see **Section 3.4**):

TTR = Parent + XDE-848 acid + XDE-848 hydroxy acid + XDE-848 benzyl hydroxy

Under hydrolysis conditions, the TTRs are considered relatively stable. The single degradate (XDE-848 acid) did not degrade further in the study conducted using the parent compound, and it was persistent at 50°C for five days at all pH values. Under aqueous photolysis conditions, in natural water, the TTR degraded with a corrected half-life of 0.20 days. For more detail, refer to **Section 3.3**.

3.2.4. Metabolism

There are five metabolism studies, all of which were conducted at 20°C, using florpyrauxifen-benzyl: aerobic soil, aerobic soil/flooded condition, anaerobic soil, aerobic aquatic, and anaerobic aquatic metabolism. The aerobic soil metabolism studies (unflooded and flooded conditions), and anaerobic soil metabolism studies, appear to be represent what occurs in the rice field. The two aquatic metabolism studies appear to be more representative of an aquatic environment.

The aerobic soil metabolism study was conducted using four soils from California, Germany and the U.K. In the study, florpyrauxifen-benzyl half-lives ranged from 8.9 to 67.2 days. The major products were XDE-848 acid and nitro hydroxy acid (major in only one of the soils), and minor products included XDE-848 hydroxy acid and XDE-848 benzyl hydroxy. Unextracted residues were high in all soils; however, a supplemental study indicated that using other solvents, with a wide range of dielectric constants, the additionally extracted residues were very small. For the TTRs, the half-lives ranged from 41-234 days.

There is an aerobic soil study, under flooded condition. The IORE half-lives for florpyrauxifen-benzyl, were 11.6-31.3 days in two soils from Italy. Major degradates in this study included XDE-848 hydroxy acid, XDE-848 acid and XDE-848 benzyl hydroxy. For the TTRs, the half-lives were 165-960 days.

The aquatic metabolism study yielded considerably shorter half-lives for the parent compound than the soil studies. In the aerobic study, the half-lives were 4.0-4.2 days in two water sediment systems from France and England. Major degradates in this study included XDE-848 hydroxy acid, XDE-848 acid, XDE-848 benzyl hydroxy and benzoic acid. For the TTRs, the half-lives were 98.9-113 days. It should be noted that the pHs of the water and sediments used in this study were from near neutral to somewhat alkaline. High pH values could promote the parent compound's hydrolysis and, in turn, affect the half-lives.

Under anaerobic aquatic conditions, for the parent compound the half-lives were 2.1-2.4 days in two sediments from Switzerland. Major degradates in this study included XDE-848 hydroxy acid, XDE-848 acid, XDE-848 benzyl hydroxy and benzoic acid. Benzyl alcohol was a minor product. For the TTRs, the half-lives were 965-16,700 days (*i.e.*, persistent to relatively stable). These much higher half-lives reflect that XDE-848 hydroxy acid was the terminal degradate. Similar to the aerobic aquatic study, the pHs of the water and sediments used in this study were from near neutral to alkaline. High pH values could have promoted the parent compound's hydrolysis and, in turn, affect the half-lives.

Figure 6 shows the degradation/metabolism pathway for florpyrauxifen-benzyl, proposed by the applicant. This pathway is consistent with the degradation profile observed in the degradation and metabolism studies. For a table showing all the degradation products of this chemical, and the maximum observed in each individual study and its associated test interval, see **Appendix I**.

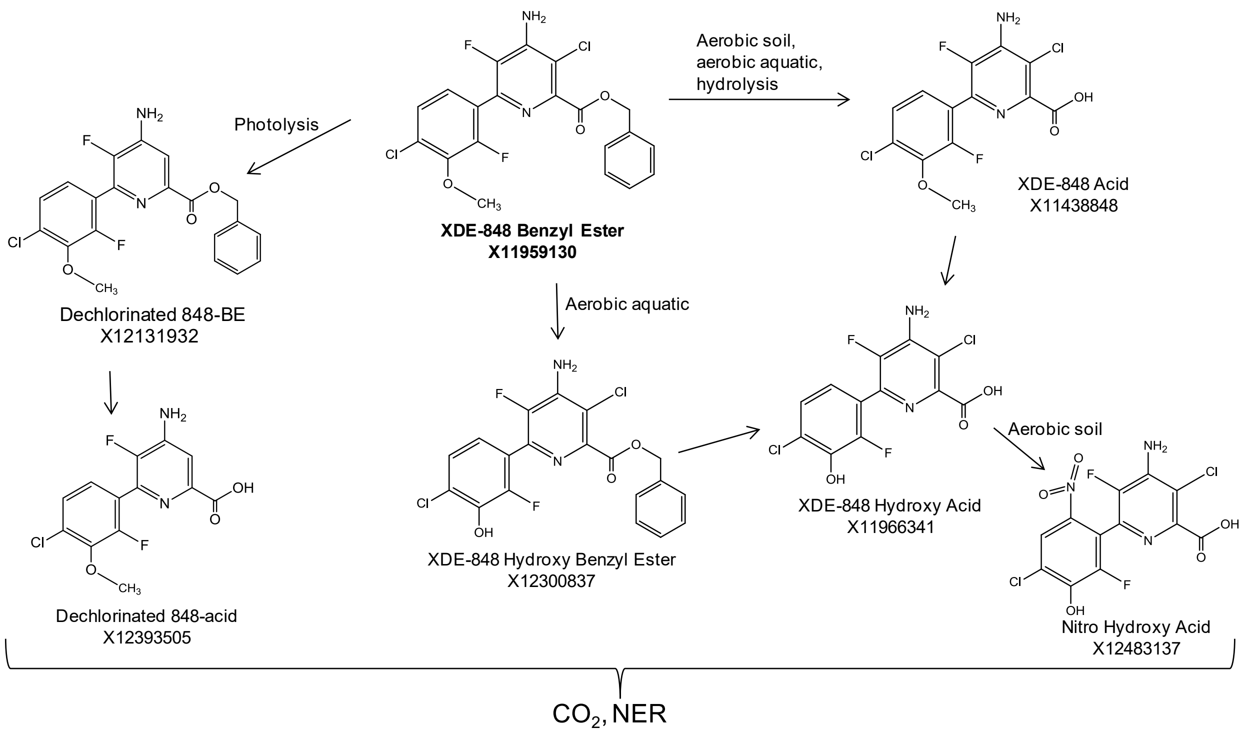


Figure 6. Applicant-Proposed Degradation/Metabolism Pathway for Florpyrauxifen-benzyl
(*Figure provided by the applicant; NER = unextracted residues)

Besides the products in the figure, benzoic acid and benzyl alcohol were measured in multiple studies; however, they are considered of low toxicological concern.

3.2.5. Mobility of Florpyrauxifen-benzyl

Tables 9 and 10 show florpyrauxifen-benzyl's adsorption and desorption results, respectively, in six soils. Based on its mean K_{OC} adsorption value of 32280 L/kg$_{OC}$, it is classified as hardly mobile (FAO 2000).

Table 9. <u>Adsorption</u> Coefficients for Florpyrauxifen-benzyl (XDE-848 Benzyl Ester) in Six Soils (MRID 49677710)

Soil	K_d (L/kg)	K_{OC} (L/kg$_{OC}$)	K_F (L/kg)	K_{FOC} (L/kg$_{OC}$)
Yolo Clay loam	248.96	31120	130.84	16354
RefSol 03G Loam	1221.64	24931	853.13	17411
Site E1 Silt loam	1358.55	30876	1474.08	33502
Site I2 Sandy loam	479.08	21777	337.90	15359
Casalino Sandy loam	575.61	44278	377.67	29051
Ogori Clay loam	895.37	40699	542.17	24644
Mean	796.54	**32280.17**	619.30	22720.17

Soil	K_d (L/kg)	K_{OC} (L/kg$_{OC}$)	K_F (L/kg)	K_{FOC} (L/kg$_{OC}$)
Standard Deviation	437.21	8746.08	483.21	7522.37
Coefficient of Variation (%)	55	27	78	33

For desorption, Freundlich coefficients were not be determined, since separate samples were prepared for the desorption study using a single nominal test concentration of 0.005 µg/mL. The $K_{d\text{-}des}$ and $K_{OC\text{-}des}$ values were higher than for adsorption for all six soils.

Table 10. Desorption Coefficients for Florpyrauxifen-benzyl (XDE-848 Benzyl Ester) in Six Soils (MRID 49677710)

Soil	$K_{d\text{-}des}$ (L/kg)	$K_{OC\text{-}des}$ (L/kg$_{OC}$)
Yolo Clay loam	539.06	67382
RefSol 03G Loam	2488.81	50792
Site E1 Silt loam	2094.81	47609
Site I2 Sandy loam	854.83	38856
Casalino Sandy loam	1642.13	126318
Ogori Clay loam	1291.45	58702

3.2.6. Mobility of Degradates

Besides the *estimated* half-life information for the degradates of florpyrauxifen-benzyl shown in the last column of **Table 8**, there is a batch equilibrium study conducted with 13 soils (only adsorption was studied), that gives information on the mobility of three of the degradates of florpyrauxifen-benzyl as follows:

- for XDE-848 acid the mean K_{OC} = 71.8 L/kg$_{OC}$ (mobile, based on FAO 2000);
- for XDE-848 hydroxy acid the mean K_d = 1.91 L/kg; and,
- for XDE-848 benzyl hydroxy the mean K_d = 118.1 L/kg.

For XDE-848 Acid, it appears that the K_{OC} model represents the mobility better than the K_d model despite its low mobility (coefficient of variation is lower for K_{OC} than K_d). All three degradates appear to be more mobile than the parent compound (**Tables 11 to 13**).

Table 11. Summary of Adsorption Coefficients for XDE-848 Acid (MRID 49677709)

Soil	K_d (L/kg)	K_{OC} (L/kg$_{OC}$)	K_F (L/kg)	K_{FOC} (L/kg$_{OC}$)
Mean	1.33	**71.8**	1.48	81.8
Highest Coefficient	2.82	174	3.02	196
Lowest Coefficient	0.21	25	0.26	30
Standard Deviation	0.89	46.9	0.93	51.2
Coefficient of Variation (%)	87	65	63	63

Table 12. Summary of Adsorption Coefficients for XDE-848 Hydroxy Acid (MRID 49677709)

Soil	K_d (L/kg)	K_{OC} (L/kg$_{OC}$)	K_F (L/kg)	K_{FOC} (L/kg$_{OC}$)
Mean	**1.91**	106.3	1.78	99.8
Highest Coefficient	5.19	270	4.38	247
Lowest Coefficient	0.14	14	0.15	15
Standard Deviation	1.66	95.2	1.44	83.5
Coefficient of Variation (%)	87	90	81	84

Table 13. Summary of Adsorption Coefficients for XDE-848 Hydroxy Benzyl Ester (MRID 49677709)

Soil	K_d (L/kg)	K_{OC} (L/kg$_{OC}$)	K_F (L/kg)	K_{FOC} (L/kg$_{OC}$)
Mean	**118.1**	5615.2	99.0	4729.6
Highest Coefficient	368.38	23024	285.97	17066
Lowest Coefficient	3.85	770	4.22	778
Standard Deviation	130.7	6523.6	104.3	4882.4
Coefficient of Variation (%)	111	116	105	105

3.2.7. Field Studies

Three aquatic field dissipation studies appear to confirm what is predicted from the laboratory studies. In one study, rice plots in California[11] (water seeded) and Texas (dry seeded) were used. In California, an emulsifiable concentrate and a granular formulation (not currently proposed in any label) were studied; in Texas, only the EC formulation was tested. Each of the three plots received two applications of florpyrauxifen-benzyl at a rate which was at least twice the currently proposed label/application. In California, both applications occurred to the rice field on a clay loam soil, when it was wet (*i.e.*, flooded). In Texas, the florpyrauxifen-benzyl was firstly applied to dry soil, while the second application was on a wet soil (flooded). The soil was a sandy loam.

The estimated half-lives in water for both applications of the EC formulation in CA were ~0.2 days. For the granular formulation, the water half-lives were 0.15-0.34 days. In soils, for the EC formulation, the first application half-life was 1.5 days and for the second application it was 23 days. For the granular formulation, the soil half-lives were 17-24 days. For the first application in TX, the water half-life does not apply (dry seeded), but for the soil, the half-life was 8.1 days. For the second application, the water half-life was 0.79 days, while the soil half-life could not be determined. Generally, the observed DT_{50}s were lower than the estimated representative half-lives, which were calculated using the NAFTA guidance (USEPA 2012).

In addition, there are two field dissipation studies, representing the aquatics proposed use pattern. In the first study, conducted in Florida and North Carolina, applications of florpyrauxifen-benzyl were performed at 50 ppb. It is apparent that 50 ppb will be a typical rate of application directly to water for the aquatics use. [According to the label, the applications at 50 ppb or less are

[11] Note that according to the proposed labels, florpyrauxifen-benzyl *is not intended for use in California*.

considered typical.] However, in another study, the maximum proposed nominal rate of 150 ppb was used; the study was conducted only in Florida. The water half-lives in FL and NC at 50 ppb for the parent compound were 1.4-2.3 days, which appears to confirm the results of the aerobic and anaerobic aquatic metabolism studies, which predicted half-lives for florpyrauxifen-benzyl on the order of about 2-6 days, depending on the testing conditions. Further, at 150 ppb, the parent's half-life was about three times as high, with 6.4 days, but still approximately in the range observed in the aquatic metabolism studies. Sediment half-lives could not be determined in these studies, due to variability and/or the small percentage of the total applied observed in the sediments.

The major degradation products observed in the rice study were not unexpected: XDE-848 acid, XDE-848 hydroxy acid and XDE-848 benzyl hydroxy (the benzyl hydroxy degradate was major only in CA, granular formulation application). For the aquatics study in FL, the major product at 150 ppb was only XDE-848 acid (35.2% of the applied), with a number of additional minor components. It was notable that two products observed only in the aqueous and soil photolysis studies were only a minor component in all three aquatic field dissipation studies: Des-chloro XDE-848 benzyl ester and Des-chloro XDE-848 acid.

3.2.8. Transport

Based on the degradation profile and the available data on the major degradates of florpyrauxifen-benzyl, the majority of the mass of parent is expected to reach paddy water/soil, while a smaller amount is expected to reach adjacent surface water by drift (maximum default value for modeling is 13.5%). The majority of parent reaching paddy water/soil is expected to partition into the soil and in the paddy environment and degrade at moderate rates [$t_{½}$ = 12-31 days in aerobic soil (flooded system), and 15-46 days in anaerobic soil environments; if the test substance is applied to dry soils, the half-lives will range from 8.9-67 days]. The following degradates are expected to form in the aquatic environments (based on the aerobic flooded and anaerobic soil metabolism studies): XDE-848 acid (which is the product of the de-esterification of florpyrauxifen-benzyl; estimated half-life of 14 days under aerobic conditions); XDE-848 benzyl hydroxy (product of demethylation of the parent compound; estimated half-life of 87 days); and XDE-848 hydroxy acid (product of the de-esterification of XDE-848 benzyl hydroxy; estimated half-lives of 127-729 days). Taken as a whole, the parent plus the degradates are much more persistent than the parent alone (**Table 14**). The acids (and XDE-848 benzyl hydroxy) are more mobile than the parent compound (**Tables 11 to 13**). Undegraded parent along with degradates listed above are expected to cause exposure to surface waters upon the release of paddy waters into surface water bodies.

Parent reaching water bodies by drift or applied directly to water (aquatics use), is expected to degrade rather quickly ($t_{½}$ = 4.0-6.2 days in aerobic aquatic, and 2.1-2.4 days in anaerobic aquatic environments), forming the following degradates (based on the aerobic and anaerobic aquatic metabolism studies): XDE-848 acid (estimated half-life of 6.3-18 days under aerobic conditions); XDE-848 benzyl hydroxy (estimated half-life of 6-14 days); and XDE-848 hydroxy acid (estimated half-life of 53-121 days aerobic; it was the terminal degradate under anaerobic conditions). Undegraded florpyrauxifen-benzyl, along with degradates listed above are expected to cause exposure to surface bodies of water impacted.

The flooded soil studies were considered representative of the paddy and the aquatic sediment studies were considered representative of an aquatics site (*e.g.*, a pond).

In cases where the surface water is clear and shallow, the following degradates may be observed based on the aquatic photolysis study (pH 4 and sterilized natural water): Des-chloro XDE-848 benzyl ester (it did not further degrade in pH 4 water), and Des-chloro XDE-848 acid (no estimated half-life available). It should be noted that in the field, these dechlorinated degradation products were found to be minor in three aquatic field dissipation studies, representing rice use in two sites, and aquatics uses in two sites (three treatments).

While water in rice paddies may leach into the subsurface, the degree of leaching is limited by the presence of impervious claypan soils. Although pesticides have been found in groundwater near rice paddies, rice growing areas are not considered to be highly vulnerable to movement of pesticides into groundwater. Rice paddies are designed to hold water for extended periods of time, and the amount of leaching is expected to be low compared to that of vulnerable areas. Surface water concentrations of pesticides are also expected to be higher than groundwater concentrations (CRC 2013)[12].

3.2.9. Bioconcentration in Fish

Based solely on its octanol/water partition coefficient (at pH 7 and 20°C, the $\log_{10} K_{OW} = 5.5$), florpyrauxifen-benzyl would be predicted to have a high potential to bioconcentrate in fish tissue, however, empirical data suggest otherwise. Specifically, a fish BCF study was conducted with bluegill sunfish (*Lepomis microchirus*) at 22°C, at nominal concentrations of 3 and 30 ppb. The latter concentration (30 ppb) being around twice the limit of solubility of the test compound. Based on the maximum total residue recovered (TRR), the maximum bioconcentration factor for whole fish was 356 L/kg ww (686 L/kg ww for non-edible tissue; 55 L/kg ww for edible tissue) [or, on a lipid normalized basis it was 4880 L/kg-lipid, for whole fish]. The 50% depuration time (t_{50}) for the TRR were on the order of only ~0.2-0.4 days. At 16 days of exposure, fish residues were identified in edible and non-edible tissue. The majority of the residue recovered (53-69% TRR) was XDE-848 acid, followed by the parent compound (8% TRR in non-edible tissue and 28% TRR in edible tissue), and the taurine conjugate of XDE-848 acid (6-8% TRR). The des-chloro-

[12] CRC. 2013. *Rice-Specific Groundwater Assessment Report*. July 2013. Central Valley Regional Water Quality Control Board. California Rice Commission. Available at (accessed May 21, 2016): http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/regulatory_information/rice_growers_sacvalley_wdrs/2013july_crc_gar_final.pdf.

XDE-848 acid (a photolysate), was a minor component of the TRR (0.8% TRR for the conjugate). There were up to 4 minor components (≤1.2% TRR) that were not identified. Greater than 85% TRR was identified in the edible and non-edible tissue.

3.3. Stressor of Concern

For this assessment, the total toxic residue (TTR) approach was used. The TTRs include those chemicals observed in the laboratory and in the field, and that have been deemed to be or to potentially be toxic to non-target organisms. Based upon environmental fate information, toxicological data, structural characteristics, and ECOSAR considerations[13], the TTRs for aquatic animals were defined as follows:

TTRs = parent florpyrauxifen-benzyl

Meanwhile, for aquatic plants, the TTRs are defined as:

TTRs = parent + XDE-848 acid + XDE-848 hydroxy acid + XDE-848 benzyl hydroxy

Plants (aquatic): As will be discussed further in **Section 4**, both the Parent and XDE-848 acid are phytotoxic to aquatic plants. Other major degradates have similar structure to acid (XDE-848 hydroxy acid) or parent (XDE-848 benzyl hydroxy). These would also be expected to be active for vascular (elongating) plants. Therefore, parent plus three major degradates would be included as the stressor of concern for plants (as defined above).

The degradates Des-chloro XDE-848 benzyl ester and Des-chloro XDE-848 acid were observed only in the aqueous photolysis study (the Des-chloro acid was a minor component in natural water photolysis or in soil photodegradation studies). Furthermore, they were very minor components in several aquatic field dissipation studies conducted in four states, representing both, rice and aquatics uses at up to the maximum rate of 150 ppb.

Plants (terrestrial): In concept, the same stressors identified for aquatic plant are considered relevant to terrestrial plants. In practice, degradation is not modeled using TerrPlant. However, terrestrial plant toxicity data are available for both the parent and XDE-848 acid. Therefore, risks are assessed using the most sensitive of the parent or acid toxicity endpoints for terrestrial plants.

Aquatic Animals: Both parent and XDE-848 acid do not appear to be acutely toxic to aquatic animals, but parent is chronically toxic in the low ppb range to aquatic invertebrates (midge and mysid, refer to **Section 4**). Furthermore, chronic toxicity data suggests that the acid is not chronically toxic to fish or invertebrates at the expected environmental concentrations (chronic

[13] For ECOSAR results for all major degradates of florpyrauxifen-benzyl, refer to the **Appendix M**.

EEC are expected to be <150 ppb). Finally, chronic studies conducted with midge suggest that the hydroxy acid and the benzyl hydroxy are not chronically toxic to midge at the expected chronic EECs (<150 ppb). Chronic toxicity endpoints derived from data submitted to the Agency are summarized in **Table 14**. In conclusion, given that it shows higher toxicity than the three degradates, the stressor of concern for aquatic animals will be defined as only florpyrauxifen-benzyl.

Table 14. Freshwater Fish and Invertebrates Available Chronic Toxicity Studies (see also Section 4)

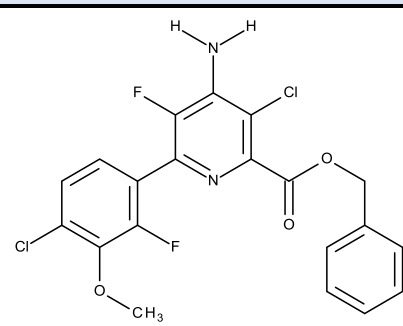
Substance	Species	NOAEC/LOAEC (ppb p.e.)
Florpyrauxifen-benzyl TGAI	Fathead	37.3 / >37.3
XDE-848 Acid	Fathead	37,500 / >37,500
Florpyrauxifen-benzyl TGAI	*D. magna*	38.5 / >38.5
XDE-848 Acid	*D. magna*	32,600 / 66,600
Florpyrauxifen-benzyl TGAI	Midge (10-d)	<4.3 / 4.3 (p.w.)
Florpyrauxifen-benzyl TGAI	Midge (28-d)	0.42 / >0.42 (p.w.)
XDE-848 benzyl hydroxy	Midge (28-d)	~550 / >550 (p.w.)
XDE-848 hydroxy acid	Midge (28-d)	~900 / >900 (p.w.)

p.e. = parent equivalents; p.w. = pore water

The degradates benzoic acid and benzyl alcohol, which have been observed in some of the laboratory studies, were considered of minor concern (**Appendix M**). These degradates are common to other pesticides with a benzyl group, and were considered of low toxicity.

Table 15 shows the structures of florpyrauxifen-benzyl and its transformation products included in the expression of the TTRs as defined above. Since these chemicals are expected to show different mobility values in the environment, EFED will calculate EECs assuming that the TTRs have the mobility of the parent, florpyrauxifen-benzyl, plus another set of EECs will be calculated assuming the mobility of XDE-848 acid. This way a range of EECs for the different characteristics of the chemicals will be compared.

Table 15. Structures of Florpyrauxifen-benzyl and its Degradates of Concern, Included in the Expression of the Total Toxic Residues (TTRs)

Common Name	Other Names	Structure	Comments
Florpyrauxifen-benzyl	Rinskor™; XDE-848 benzyl ester; XDE-848 BE; XDE-848; 848; SX-1552; X11959130		Parent compound

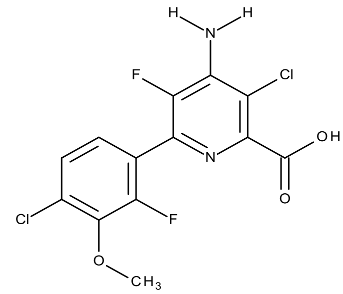
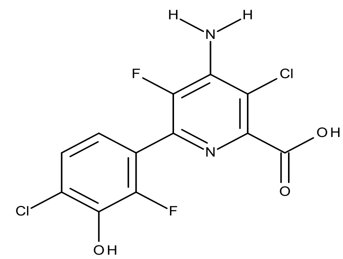
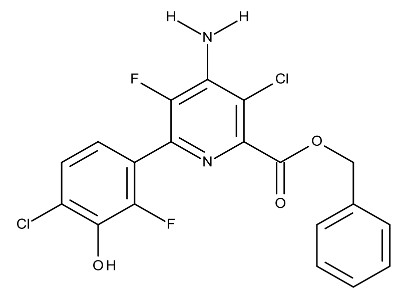
Common Name	Other Names	Structure	Comments
XDE-848 acid	X11438848		Acid form of parent; Hydrolysate, soil metabolite (aerobic and anaerobic), aquatic metabolite (aerobic and anaerobic)
XDE-848 hydroxy acid	Hydroxy acid; X11966341		Soil/sediment, water metabolite
XDE-848 hydroxy benzyl ester	XDE-848 benzyl hydroxy; Benzyl hydroxy; X12300837		Soil/sediment, water metabolite

Table 16 provides a comparison of the t_{input} half-lives (defined as the 90th percentile confidence bound on the mean) for the parent alone, against the t_{input} half-lives for the parent plus the three degradates that were included as the total toxic residues or residues of concern (TTRs). The table also provides ranges of representative half-lives (t_{rep}), where applicable with the parentheses. As shown in the table, the half-lives for the TTRs are considerably higher, particularly for the two flooded soil systems, and the two aquatic metabolism studies.

Table 16. Comparison of t_{input} Half-lives for the Parent Alone against for the Total Toxic Residues[1]

Process[1]	Notes	Parent t_{input} (days)	TTRs t_{input} (days)
Hydrolysis	pH 7	111	Stable
Aqueous Photolysis	pH 4 buffer	0.0786	0.0786
	Natural water	0.161	0.199
Atmospheric Degradation	OH radical rxn.	1.1	
Aerobic Soil	4 soils	55.3 (9-67.2)	196 (41-234)
Aerobic Soil (flooded)	2 soils	44.6 (11.6-31.3)	1,787 (165-960)
Anaerobic Soil Metabolism	4 soils	41.5 (14.8-46.2)	7,181 (417-stable)
Aerobic Aquatic Metabolism	2 sediments	8.36 (4.04-6.16)	128 (98.9-113)
Anaerobic Aquatic Metabolism	2 sediments	2.65 (2.1-2.37)	33,118 (965-16,734)

TTRs = parent + XDE-848 acid + XDE-848 hydroxy acid + XDE-848 benzyl hydroxy.

[1] Ranges of representative half-lives (t_{rep}), where applicable, are presented within the parentheses.

3.4. Aquatic Exposure Assessment

3.4.1. Model Description

The Pesticide in Flooded Application Model (PFAM v.2.0, date released September 30, 2016) is used to model the rice uses of florpyrauxifen-benzyl. PFAM is used by the Agency to estimate pesticide concentrations in surface water from the use of pesticides in flooded fields, such as rice paddies. PFAM simulates water and pest management practices, pesticide degradation in soil and aquatic environments, as well as discharge of paddy waters to lotic or lentic user defined waterbodies (**Figure 7**). The water body depth may change due to precipitation, refill, drainage, evaporation, and weir-height changes. The model consists of two regions—a water column and a benthic region. Each individual region is completely mixed and at equilibrium with all phases within the individual region, and equilibrium within each region follows a linear isotherm. The two regions are coupled by a first-order mass-transfer process. Chemical transformation processes (*i.e.*, hydrolysis, bacterial metabolism, photolysis, and sorption) within each region are formulations that were heavily borrowed from the USEPA EXAMS model (Burns, 2000). Changes in water body conditions (temperature, water levels, wind speed, *etc.*) and the resulting changes in degradation rates occur on a daily time step. The selection of a daily time step was mainly because of the availability of a large amount of daily meteorological data (Burns *et al.*, 2007) and the USEPA's historical use of EXAMS on a daily time step.

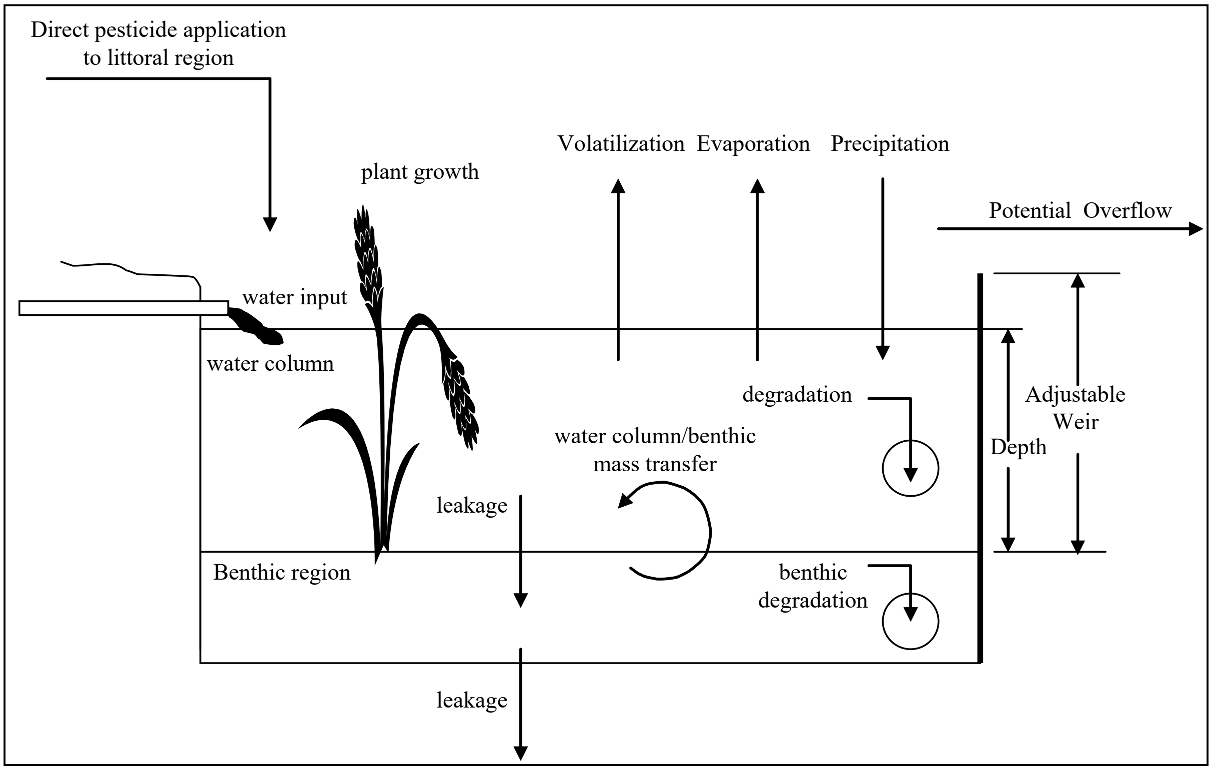


Figure 7. The conceptual model for applications of florpyrauxifen-benzyl in a flooded field, showing hydrological and chemical processes that occur in a rice paddy (USEPA 2016b)

For agricultural and certain non-agricultural uses, exposure concentrations for surface waters assessments are estimated based on EFED's Tier II aquatic models Pesticide Root Zone Model (PRZM) and Varying Volume Water Body Model (VVWM). A graphical user interface PWC v.1.52 (date released April 1, 2016), developed by the EPA, was used to facilitate inputting chemical and use specific parameters into the appropriate input files and chemical files. The PWC estimates pesticide concentrations in surface water bodies that result from pesticide applications to land and water via spray drift. The calculator was designed for regulatory applications as applied in the Office of Pesticide Programs, USEPA, as well as PMRA, Health Canada. The PWC calculator uses the Pesticide Root Zone Model (PRZM5) and the Variable Volume Water Model (VVWM), a replacement for the older EXAMS model. From this model, only the VVMW module was used in this modelling approach. This was accomplished by setting the application efficiency to zero (0), where no material is hitting the terrestrial field, and the spray drift fraction to 1.0, meaning that effectively the material is falling on the standard pond at the stated application rate. One application at a typical rate of 50 ppb and another at the maximum rate of 150 ppb were separately modeled.

Additional information about EFED's aquatic models (PFAM and PWC) is provided in the Agency's website[14].

[14] http://www2.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment (accessed

3.4.2. Rice Use (PFAM v.2.0)

For the modeling of rice use for florpyrauxifen-benzyl, many of the fate input parameters are similar to those used in the Pesticides in Water Calculator (PWC), which is used for conventional agricultural crops. They include the environmental fate input parameters. The model also offers several options related to the flooding and release of the water, and crop parameters. **Table 17** shows the input parameters for florpyrauxifen-benzyl (Chemical and Applications tabs); the table is followed by the Crop, Physical and Watershed tabs table (**Table 18**), and the Floods tab tables (**Tables 19 to 28**) showing the flood events for the different available scenarios. Note that despite the fact that CA is an important rice producer, and there are two available scenarios to model rice in CA, they were not used in this assessment, since the chemical is not currently being proposed for use in CA (**Section 3.1**).

Table 17. PFAM inputs specific to Florpyrauxifen-benzyl parent only and TTRs[1]

Input Parameter	Value[2]	Source	Comment
Chemical Tab			
Water Column Half-life (20°C)	44.6 days for the parent only; --- 1,787 days for the TTRs	MRID 49677716	Represents the 90th percentile of the upper confidence bound on the mean out of two values (**Table 8**).
Benthic Compartment Half-Life (20°C)	41.5 days for the parent only; --- 7,181 days for the TTRs	MRID 49677718	Represents the 90th percentile of the upper confidence bound on the mean out of four values (**Table 8**).
Un-flooded Soil Half-life (20°C)	55.3 days for the parent only; --- 196 days for the TTRs	MRID 49677715	Represents the 90th percentile of the upper confidence bound on the mean out of four values (**Table 8**).
Aqueous Near Surface Photolysis Half-life (at 40°N)	0.161 days for the parent only; --- 0.199 days for the TTRs	MRID 49677712	Value at 40°N Latitude. Used the corrected half-life in natural water, which was slightly higher than in pH 4 buffered solution.
Hydrolysis Half-life	111 days for the parent only; --- 0 for the TTRs (stable)	MRID 49677711	At pH 7.

November 17, 2016).

Input Parameter	Value[2]	Source	Comment
Organic Carbon Partition Coefficient (K_{OC}); based on the mobility of the parent *florpyrauxifen-benzyl*.[3]	32,280 mL/g_{OC}	MRID 49677710	Average of six values. The K_{OC} model represents the mobility better than the K_d model (binding appears to correlate with organic carbon, the coefficient of variation for the K_{OC} dataset is less than for the K_d dataset).
Organic Carbon Partition Coefficient (K_{OC}); based on the mobility of the major degradate *XDE-848 acid*.[3]	71.8 mL/g_{OC}	MRID 49677709	Average of 13 values. The K_{OC} model represents the mobility better than the K_d model (the coefficient of variation for the K_{OC} dataset is *slightly* less than for the K_d dataset).
Molecular Weight	439.2 g/mole	MRID 49677702	For the parent compound.
Vapor Pressure (20°C)	2.4 x 10^{-7} torr	MRID 49677702	For the parent compound.
Solubility (20°C)	0.015 mg/L	MRID 49677702	In purified water at 20°C, for the parent compound.
Heat of Henry	52,845 J/mol	HENRYWIN	Estimated using HENRYWIN program in EPI Suite (see **Appendix D**).
Henry Reference Temperature	20°C	User defined	Assumed. Temperature of vapor pressure measurement.
Applications Tab			
Distribution of Days or Specific Days	Specific Days	–	Default for ecological exposure
First Day of Application (Month/day)	5/18 (AR) 5/1 (LA) 5/19 (MS) 5/22 (MO) 4/26 (TX)	Labels	Assumed for Arkansas, Louisiana, Mississippi, Missouri, Texas to occur 7 days after zero height reference. See next comment.
Application Timing	See comments on the right column →	Labels	According to the label, it should be applied from 2 leaf stage (drill-seeded rice or water-seeded rice) with no exposed roots up to 60 days before harvest. PHI = 60 days. For specific day of first application, see previous row.
Maximum Single Application Rate	0.0300 kg a.i./ha	Labels	–
Maximum Number of Applications	2	Labels	–
Minimum Interval Between Applications	14 days	Labels	–
Slow release	0 day^{-1}	–	Default; this is used if the formulation slowly releases the pesticide over time.
Drift factor	0	–	Default for ecological risk assessments.
Holding Period Duration	Not specified	Labels	Not specified. PFAM model report recommends to hold the water on the rice paddy after the application and until harvest.

AR=Arkansas; LA=Louisiana; TX=Texas; MS=Mississippi; MO=Missouri. Although there is a CA rice scenario, it was not modelled, since CA is not listed in the products' labels.

[1] TTRs = parent + XR-848 hydroxy acid + XR-848 Acid + XR-848 benzyl hydroxy.

[2] Input values were selected according to the Guidance for Selecting Input Parameters for the Pesticide in Flooded Applications Model (PFAM) Including Specific Instructions for Modeling Pesticide Concentrations in Rice Growing Areas, Version 1 (USEPA, 2016c).

[3] A range of K_{OC} values was used in calculating the EECs.

Table 18 shows a summary of the Crop, Physical and Watershed tabs for florpyrauxifen-benzyl, for the rice use.

Table 18. Summary of model inputs for the Crop, Physical and Watershed tabs for Florpyrauxifen-benzyl[1]

Parameter	Value	Source or Comment
Crop Tab		
Zero Height Reference Month/Day (State)	5/11 (AR) 4/24 (LA) 5/12 (MS) 5/15 (MO) 4/19 (TX)	See metadata file (USEPA 2016d)
Days from Zero Height to Full Height	115 (AR) 102 (LA) 111 (MS) 118 (MO) 103 (TX)	See metadata file (USEPA 2016d)
Days from Zero Height to Removal	136 (AR) 123 (LA) 132 (MS) 139 (MO) 124 (TX)	See metadata file (USEPA 2016d)
Maximum Fractional Areal Coverage	1.0 (All scenarios)	See metadata file (USEPA 2016d)
Physical Tab		
Meteorological files	AR (w13963) LA (w03937) MS (w03940) TX (w13958) MO (w13994)	Meteorological data available EPA Models web site (SAMSON data). Stations correspond to Little Rock, AR (w13963), Lake Charles, LA (w03937), Jackson, MS (w03940), Austin, TX (w13958), and St. Louis, MO (w13994)
Latitude	AR 36.2° LA 31° MS 32° TX 30° MO 39°	Corresponds to latitude of meteorological station.
Area of Application (m^2)	Ecological Risk Assessment: 100,000	This input does not have an impact on the concentration estimated inside the rice paddy and for the Ecological Risk Assessment.
Weir Leakage (m/d)	0	PFAM default
Benthic Leakage (m/d)	0	PFAM default
Mass transfer coefficient (m/s)	$1x10^{-8}$	PFAM default
Reference depth (m)	0.1016	Set to same depth as initial weir height, per PFAM guidance.
Benthic depth (m)	0.05	PFAM default
Benthic porosity	0.50	PFAM default
Dry bulk density (g/cm^3)	1.35	PFAM default
F_{OC} Water Column on SS	0.04	PFAM default
F_{OC} benthic	0.01	PFAM default

Parameter	Value	Source or Comment
SS (mg/L)	30	PFAM default
Water column DOC (mg/L)	5.0	PFAM default
Chlorophyll CHL (mg/L)	0.005	PFAM default
Dfac	1.19	PFAM default
Q10	2	PFAM default
Watershed Tab		
Calculate Downstream waterbody concentrations	NO	Selected NO for ecological risk assessments.
Area of Surrounding Watershed (m^2)	These parameters do not apply to ecological risk assessments.	Does not apply
Curve Number of Surrounding Watershed		
Base flow (m^3/s)		
Width of waterbody (m)		
Depth of waterbody (m)		
Length of waterbody (m)		

AR=Arkansas; LA=Louisiana; TX=Texas; MS=Mississippi; MO=Missouri. Although there is a relevant CA scenario, it was not modelled, since CA is not listed in the products' labels.

[1] See also the metadata file (USEPA 2016d).

Tables 19 to 28 show the input parameters for the Floods tab in PFAM for the available modeling scenarios. For all of the states there are two available scenarios: one simulates a winter flood and the other simulates no winter flooding event. As shown in the tables, these scenarios include turnover (for metadata files, see USEPA, 2016d)[15].

Table 19. Arkansas, Winter Flood, Input Parameters in the Flood Tab (ECO AR Winter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				May 4				Midpoint of typical plant date is 5/1. First flush occurs Plant + 3 days.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				4				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	–
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood Field 5/4
122	0	122	0	122	0	122	0	Drain field 14 days prior to harvest (9/3)
181	0.1016	181	0.1016	181	0.1016	181	0.017	Flood field for winter Flood 11/1
271	0	271	0	271	0	271	0	Drain field after winter flood 1/30

[15] Although there is a relevant California scenario, it was not modelled, since CA is not listed in the label among the states where this chemical is intended to be applied.

Table 20. Arkansas, No Winter Flood, Input Parameters in the Flood Tab (ECO AR noWinter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				May 4				Midpoint of typical plant date is 5/1. First flush occurs Plant + 3 days.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				2				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	–
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood Field 5/4
122	0	122	0	122	0	122	0	Drain field 14 days prior to harvest (9/3)

Table 21. Louisiana, Winter Flood, Input Parameters in the Flood Tab (ECO LA Winter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				April 11				Midpoint of typical plant date is 4/14. First flush occurs Plant – 3 days.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				4				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood Field (4/11)
122	0	122	0	122	0	122	0	Drain field (8/11)
204	0.1016	204	0.1016	204	0.1016	204	0.017	Winter flood (11/1)
294	0	294	0	294	0	294	0	Drain (01/30)

Table 22. Louisiana, No Winter Flood, Input Parameters in the Flood Tab (ECO LA noWinter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				April 11				Midpoint of typical plant date is 4/14. First flush occurs Plant – 3 days.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				2				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood Field (4/11)
122	0	122	0	122	0	122	0	Drain field (8/11)

Table 23. Mississippi, Winter Flood, Input Parameters in the Flood Tab (ECO MS Winter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				May 10				Midpoint of typical plant date is 5/2. First flush occurs Plant + 8 days.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				4				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1524	0	0.1524	0	0.1524	0	0.017	Flood field 5/10
125	0	125	0	125	0	125	0	Drain field 9 days prior to harvest (9/12)
175	0.1524	175	0.1524	175	0.1524	175	0.017	Winter flood (11/1)
265	0	265	0	265	0	265	0	Drain (01/30)

Table 24. Mississippi, No Winter Flood, Input Parameters in the Flood Tab (ECO MS noWinter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				May 10				Midpoint of typical plant date is 5/2. First flush occurs Plant + 8 days.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				2				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1524	0	0.1524	0	0.1524	0	0.017	Flood field 5/10
125	0	125	0	125	0	125	0	Drain field 9 days prior to harvest (9/12)

Table 25. Missouri, Winter Flood, Input Parameters in the Flood Tab (ECO MO Winter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				May 6				Midpoint of typical plant date is 5/5. First flush occurs Plant + 1 day.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				4				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood field at 4" (5/6)
127	0	127	0	127	0	127	0	Drain field 21 days prior to harvest (9/10)
179	0.1016	179	0.1016	179	0.1016	179	0.017	Winter flood (11/1)
269	0	269	0	269	0	269	0	Drain (01/30)

Table 26. Missouri, No Winter Flood, Input Parameters in the Flood Tab (ECO MO noWinter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				May 6				Midpoint of typical plant date is 5/5. First flush occurs Plant + 1 day.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				2				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood field at 4" (5/6)
127	0	127	0	127	0	127	0	Drain field 21 days prior to harvest (9/10)

Table 27. Texas, Winter Flood, Input Parameters in the Flood Tab (ECO TX Winter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				April 10				Midpoint of typical plant date is 4/9. First flush occurs Plant + 1 day.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				4				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood field at 4 inches (4/10)
119	0	119	0	119	0	119	0	Drain field 14 days prior to harvest (8/7)
205	0.1016	205	0.1016	205	0.1016	205	0.017	Winter flood (11/1)
295	0	295	0	295	0	295	0	Drain (01/30)

Table 28. Texas, No Winter Flood, Input Parameters in the Flood Tab (ECO TX noWinter.pfs)

Parameter				Value				Source or Comment
Floods Tab								
Reference Date				April 10				Midpoint of typical plant date is 4/9. First flush occurs Plant + 1 day.
Gradual or sharp transition				Sharp				This simulates the release of water from rice paddy.
Number of Events				2				Number of events need to capture flooding and releases over an entire year and simulate the holding period.
Fill Level		Weir		Min. Level		Turn over		–
Days	(m)	Days	(m)	Days	(m)	Days	d^{-1}	
0	0.1016	0	0.1016	0	0.1016	0	0.017	Flood field at 4 inches (4/10)
119	0	119	0	119	0	119	0	Drain field 14 days prior to harvest (8/7)

3.4.3. Aquatic Use

Table 29 summarizes the inputs used for florpyrauxifen-benzyl in aquatic sites, using the PWC v.1.52, with modifications, (a) to disallow chemical application on the crop (FL peppers), and (b) to account for the processes occurring in the standard pond (2 meters deep). This was accomplished by setting the application efficiency to zero and the spray drift fraction to one. It should be noted that the foliar aquatic use pattern was not modelled for determining aquatic EECs, since the application rate is only a small fraction than that estimated for the in-water use to the standard pond (*i.e.*, 0.0527 lb a.i./A x 2 applications for the foliar use vs. 2.671 lb a.i./A for the in-water use assuming the standard pond at 150 ppb).

Table 29. Pond model inputs specific to Florpyrauxifen-benzyl parent only and TTRs[1]

Input Parameter	Value	Source	Comment
Hydrolysis at pH 7	111 days for the parent; ---- Stable for the TTRs	49677711	XDE-848 acid is the major degradate, which is stable to further hydrolysis.
Water Column Half-life (20°C)	8.36 days for the parent; ---- 128 days for the TTRs	49677719	Represents the 90th percentile of the upper confidence bound on the mean out of two values (at 20°C; **Table 8**).
Benthic Metabolism Half-life (20°C)	2.65 days for the parent; ---- 33,118 days for the TTRs	49677720	Represents the 90th percentile of the upper confidence bound on the mean out of two values (at 20°C; **Table 8**).
Aqueous Photolysis Half-life (40°N)	0.161 days for parent ---- 0.199 days for TTRs	49677712	In natural water.
Aerobic Soil Metabolism Half-life (20°C)	55.3 days for the parent; ---- 196 days for the TTRs	49677715	Represents the 90th percentile of the upper confidence bound on the mean out of four values (at 20°C; **Table 8**).
Organic Carbon Partition Coefficient (K_{OC}); based on the mobility of the parent ***florpyrauxifen-benzyl***.	32,280 mL/g_{OC}	49677710	Average of six values. The K_{OC} model represents the mobility better than the K_d model (binding appears to correlate with organic carbon, the coefficient of variation for the K_{OC} dataset is less than for the K_d dataset).[2]
Organic Carbon Partition Coefficient (K_{OC}); based on the mobility of the major degradate ***XDE-848 acid***.	71.8 mL/g_{OC}	49677709	Average of 13 values. The K_{OC} model represents the mobility better than the K_d model (the coefficient of variation for the K_{OC} dataset is *slightly* less than for the K_d dataset).[2]
Application Efficiency	0	----	Not used. The assumption is application to the standard pond.

Input Parameter	Value	Source	Comment
Spray Drift Fraction	1.00	----	Spray is applied directly to the standard pond.
Typical Application Rate	1.00 kg a.i./ha	Proposed Labels	For the standard pond (2.00 meters deep), the equivalent application rate is 0.890 lb a.i./A to achieve 50 ppb.
Maximum Application Rate	2.99 kg a.i./ha	Proposed Labels	For the standard pond (2.00 meters deep), the equivalent application rate is 2.671 lb a.i./A to achieve 150 ppb.
Maximum Number of Applications	Assume 1	Proposed Labels	At the maximum rate, only one application is allowed. At lower rates, multiple applications are allowed; however, for illustration, a single application at 50 ppb was modelled.
Foliar Half-life	0	----	Not used in calculations.
Molecular Weight	439.2 g/mole	49677702	----
Vapor Pressure (25°C)	$3.5x10^{-7}$ torr	49677702	----
Water Solubility (20°C)	0.015 mg/L	49677702	In purified water.
Scenario	FL Peppers	Assumed	A FL representative scenario was selected. Two of the aquatic field dissipation studies were conducted in FL.
Date of Application	March 15	Assumed	Set to coincide *approximately* with the date of application in FL pond in the aquatic field dissipation study.

Input values were selected according to the "Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides", dated November 10, 2009 and available at: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/guidance-selecting-input-parameters-modeling (accessed March 15, 2017).

[1] TTRs = parent + XR-848 hydroxy acid + XR-848 Acid + XR-848 benzyl hydroxy.

[2] Modelling included both, the mobility of the parent compound and the one for the acid, in order to get a range of concentrations illustrating the possible EECs, depending on the fate properties of the TTRs.

3.4.4. Modelling Results

The modeling results *for the TTRs* are presented in **Tables 30 and 31**, using the K_{OC} for the parent and K_{OC} for the acid, respectively. The scenarios yielding the highest and lowest EECs for the TTRs assuming the K_{OC} for the parent compound (from **Table 30**), were also run using the K_{OC} for the acid compound, in order to obtain a range in EECs based on the highest and lowest K_{OC} values. Results presented in **Table 32** are for the parent alone, which was modelled for comparison, and in order to calculate a subset of RQs assuming that only the parent if of concern. **Tables 31 and 32** show only a subset of the scenarios shown in **Table 30**.

Figure 8 shows an example of flood events, as plotted by PFAM, for the Arkansas scenario with winter flood (for specific inputs see also **Table 19**), showing two applications 14 days apart. The first flood event occurs on day 0 or reference date (May 4). The water is released (drained) on day 122 (September 3). The winter flood occurs on day 181 (November 1), and finally drained again on day 271 (January 30). The flood events (golden lines marked 'Minimum') are set to 0.1016 meters (4 inches). Each application occurs at the maximum rate of 0.0300 kg a.i./ha (two red lines marked Applications).

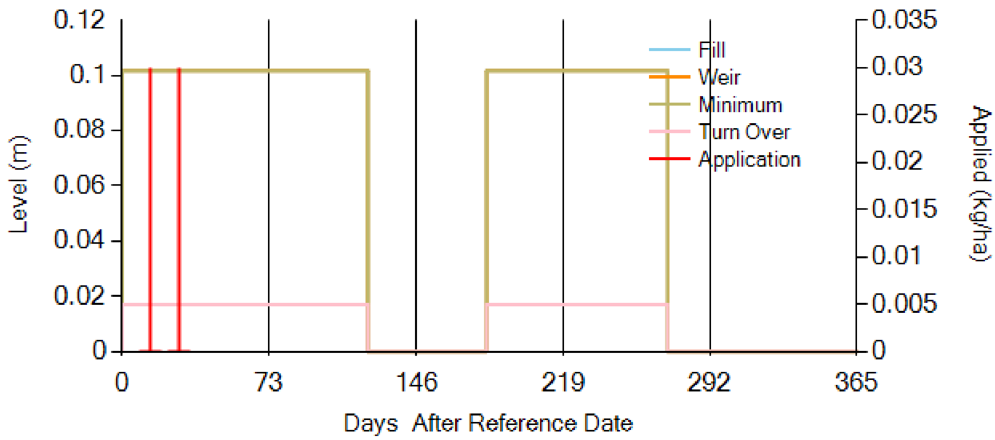


Figure 8. Example Flood Events for Florpyrauxifen-benzyl, AR *with* Winter Flood Scenario
(for a brief description of events, see previous paragraph)

It was noted that the EECs for the aquatic use pattern (in-water) were higher than for the rice use pattern. Further, the EECs calculated using the K_{OC} for the acid were higher than using the K_{OC} for the parent compound. For the aquatic in-water uses, the peak EECs were very close to the nominal concentration of 50 ppb for the typical rate, and 150 ppb for the maximum rate. In laboratory studies, it was found that, in the presence of a cosolvent, or formulation, higher effective solubility values were achieved. It should be noted that for the aquatic in-water applications, the maximum nominal application rate is 150 ppb, a value which is utilized in the risk assessment for acute exposure.

Table 30. Water Column, Pore Water, and Sediment EECs for Florpyrauxifen-benzyl TTRs, *Using the Mobility (K_{OC}) of the Parent Compound* (Florpyrauxifen-benzyl)[1]

Run No./ Scenario / Use Represented	App Method	App Rate kg a.i./ha	Date of First Application (month/day)	Number of Apps	App Interval (days)	Water Column			Pore Water		Sediment
						Peak EEC (µg/L)	21-day average EEC (µg/L)	60-day average EEC (µg/L)	Peak EEC (µg/L)	21-day average EEC (µg/L)	21-day average EEC (µg/kg-dw)
Rice Use[2]:											
AR, No Winter Flood	Aerial[3]	0.0300	5/18	2	14	6.60	0.759	0.391	0.265	0.256	82.7
AR, Winter Flood	Aerial[3]	0.0300	5/18	2	14	6.61	0.767	0.401	0.273	0.264	85.3
LA, No Winter Flood	Aerial[3]	0.0300	5/1	2	14	6.45	0.738	0.377	0.250	0.241	77.9
LA, Winter Flood	Aerial[3]	0.0300	5/1	2	14	6.46	0.738	0.380	0.253	0.245	79.2
MO, No Winter Flood	Aerial[3]	0.0300	5/22	2	14	6.57	0.765	0.399	0.274	0.265	85.6
MO, Winter Flood	Aerial[3]	0.0300	5/22	2	14	6.58	0.775	0.405	0.285	0.275	88.9
MS, No Winter Flood	Aerial[3]	0.0300	5/19	2	14	6.28	0.748	0.386	0.256	0.248	80.2
MS, Winter Flood	Aerial[3]	0.0300	5/19	2	14	6.28	0.758	0.394	0.266	0.258	83.3
TX, No Winter Flood	Aerial[3]	0.0300	4/26	2	14	6.46	0.736	0.379	0.255	0.246	79.6
TX, Winter Flood	Aerial[3]	0.0300	4/26	2	14	6.56	0.742	0.384	0.258	0.249	80.3
Aquatics Use:											
FL Peppers, Aquatics Use (typical rate, at 50 ppb)	In-water	1.00[4]	3/15	1	N/A	50.0 (47.5)[5]	4.84	2.97	2.28	2.26	2915
FL Peppers, Aquatics Use (at maximum rate 150 ppb)	In-water	2.99[4]	3/15	1	N/A	150 (142)[5]	14.5	8.87	6.83	6.75	8708

AR=Arkansas; LA=Louisiana; MS=Mississippi; MO=Missouri; TX=Texas.

[1] EECs were rounded to three significant figures.

[2] Although there are California scenarios, they were not modelled, since currently the applicant is not applying for registration on rice in California.

[3] The method of application (aerial or ground) does not affect the EECs calculated using PFAM. In the PFAM model, the spray drift input value applies only to drinking water assessments.

[4] This is the application rate, in kg a.i./ha, required for the standard pond 2 meters deep, to achieve the nominal concentration.

[5] Nominal concentration. The modeled value is presented in parenthesis.

Table 31. Water Column, Pore Water, and Sediment EECs for Florpyrauxifen-benzyl TTRs, *Using the Mobility (K_{OC}) of XDE-848 Acid*[1]

Run No./ Scenario / Use Represented	App Method	App Rate kg a.i./ha	Date of First Application (month/day)	Number of Apps	App Interval (days)	Water Column			Pore Water		Sediment
						Peak EEC (µg/L)	21-day average EEC (µg/L)	60-day average EEC (µg/L)	Peak EEC (µg/L)	21-day average EEC (µg/L)	21-day average EEC ($\mu g/kg_{-dw}$)
Rice Use:											
AR, No Winter Flood	Aerial[2]	0.0300	5/18	2	14	20.1	3.02	1.06	0.945	0.837	91.1
AR, Winter Flood	Aerial[2]	0.0300	5/18	2	14	20.1	3.02	1.06	0.925	0.819	89.1
MS, No Winter Flood	Aerial[2]	0.0300	5/19	2	14	15.1	3.05	1.08	0.940	0.846	92.1
MS, Winter Flood	Aerial[2]	0.0300	5/19	2	14	15.1	3.05	1.08	0.925	0.834	90.8
Aquatics Use:											
FL Peppers, Aquatics Use (typical rate, at 50 ppb)	In-water	1.00[3]	3/15	1	N/A	50.0 (50.0)[4]	24.7	10.7	7.27	7.09	23.0
FL Peppers, Aquatics Use (at maximum rate 150 ppb)	In-water	2.99[3]	3/15	1	N/A	150 (149)[4]	73.8	31.9	21.7	21.2	68.7

AR=Arkansas; MS=Mississippi.

[1] EECs were rounded to three significant figures and expressed in parent equivalents.

[2] The method of application (aerial or ground) does not affect the EECs calculated using PFAM. In the PFAM model, the spray drift input value applies only to drinking water assessments.

[3] This is the application rate, in kg a.i./ha, required for the standard pond 2 meters deep, to achieve the nominal concentration.

[4] Nominal concentrations. The modeled value is presented in parenthesis.

Table 32. Water Column, Pore Water, and Sediment EECs for Florpyrauxifen-benzyl (Parent Only), *Using the Mobility (K_{OC}) of the Parent*[1]

Run No./ Scenario / Use Represented	App Method	App Rate kg a.i./ha	Date of First Application (month/day)	Number of Apps	App Interval (days)	Water Column			Pore Water		Sediment
						Peak EEC (µg/L)	21-day average EEC (µg/L)	60-day average EEC (µg/L)	Peak EEC (µg/L)	21-day average EEC (µg/L)	21-day average EEC (µg/kg)
Rice Use:											
AR, No Winter Flood	Aerial[2]	0.0300	5/18	2	14	6.34	0.679	0.289	0.181	0.149	48.1
AR, Winter Flood	Aerial[2]	0.0300	5/18	2	14	6.34	0.679	0.289	0.181	0.149	48.1
MS, No Winter Flood	Aerial[2]	0.0300	5/19	2	14	6.03	0.668	0.285	0.178	0.144	46.7
MS, Winter Flood	Aerial[2]	0.0300	5/19	2	14	6.03	0.668	0.285	0.178	0.144	46.6
Aquatics Use:											
FL Peppers, Aquatics Use (typical rate, at 50 ppb)	In-water	1.00[3]	3/15	1	N/A	50.0 (46.4)[4]	2.73	0.956	0.577	0.191	246
FL Peppers, Aquatics Use (at maximum rate 150 ppb)	In-water	2.99[3]	3/15	1	N/A	150 (139)[4]	8.17	2.86	1.72	0.570	735

AR=Arkansas; MS=Mississippi.

[1] EECs were rounded to three significant figures and expressed in parent equivalents.

[2] The method of application (aerial or ground) does not affect the EECs calculated using PFAM. In the PFAM model, the spray drift input value applies only to drinking water assessments.

[3] This is the application rate, in kg a.i./ha, required for the standard pond 2 meters deep, to achieve the nominal concentration.

[4] Nominal concentrations. The modeled value is presented in parenthesis.

3.5. Terrestrial Exposure Assessment

3.5.1. Birds & Mammals (T-REX & KABAM)

T-REX version 1.5.2[16] calculates the residues on avian and mammalian food items along with the dissipation rate of a chemical applied to foliar surfaces for single or multiple applications. Based on residue and dissipation rate calculations, this spreadsheet-based model also estimates acute and chronic risk quotients. The results are presented by weight class for various sized birds and mammals for each type of application. Furthermore, T-REX adjusts acute and chronic toxicity values based on the relative body weight of the animal being assessed compared with the animal used in the toxicity studies.

The KABAM model (ver. 1.0)[17] is used to estimate potential bioaccumulation of hydrophobic organic pesticides in freshwater aquatic food webs and subsequent risks to mammals and birds via consumption of contaminated aquatic prey. The bioaccumulation portion of KABAM is based on Arnot and Gobas (2004), who parameterized a bioaccumulation model using data on PCBs and some pesticides (*e.g.,* lindane, DDT) in freshwater aquatic ecosystems. KABAM relies on a chemical's octanol-water partition coefficient (K_{OW}) to estimate uptake and elimination constants through respiration and diet of organisms in different trophic levels. Pesticide residues in tissue are calculated for organisms at different trophic levels of an aquatic food web. The model then uses pesticide tissue concentrations in aquatic animals to estimate dose- and dietary-based exposures and associated risks to mammals and birds consuming aquatic organisms.

Although the default parameterization of KABAM assumes no chemical metabolism by biota, the metabolism rate constant can be adjusted to reflect appropriate information on chemical metabolism. For florpyrauxifen-benzyl, evidence from the BCF study suggests that *in vivo* chemical metabolism is important, given that the measured BCF for fish (356 L/kg w.w.) is so much lower than the BCF estimated with KABAM (15,195 L/kg w.w.). Furthermore, the BCF study indicates rapid depuration of total radioactive residues (depuration half-life of ~0.2 to 0.4 days) which likely reflects chemical metabolism. Time to steady state was estimated to be from 3 to 16 days (MRID 49677749). The majority of the residue recovered (53-69% TRR) was XDE-848 acid, followed by the parent compound (8% TRR in non-edible tissue and 28% TRR in edible tissue), and the taurine conjugate of XDE-848 acid (6-8% TRR).

Given this evidence of rapid metabolism and chemical depuration in fish, an empirically-based metabolism rate constant (K_m) of 1.74 d^{-1} was estimate for florpyrauxifen-benzyl using the fish BCF study (for details, see **Appendix F**). A 21-d EEC was selected in order to be comparable to

[16] https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment#terrestrial
[17] *ibid*

the longest time required to reach steady state in the BCF study. Other chemical-specific input parameters for the KABAM model are shown in **Table 33**.

Table 33. Input parameters for KABAM model

Characteristic	Value	Source/Comments
Log K_{OW}	5.5	MRID 49677702
K_{OC} (L/kg OC)	32,280	MRID 49677710
Estimated time to steady state (T_S; days)	3-16 days	Values based on estimated time to reach steady state from the fish BCF study (MRID 49677749)
Surface water EEC (µg/L)	0.679 (rice) 2.73 (aquatic, typical rate) 8.17 (aquatic, max. rate)	Parent only 21-d EECs (Table 31).
Pore Water EEC (µg/L)	0.149 (rice) 0.191 (aquatic, typical rate) 0.570 (aquatic, max. rate)	Parent only 21-d EECs (Table 31)
Metabolism rate constant (K_m) 1/d	1.74	Based on fish BCF study (Appendix F).

Additional information on input parameters for abiotic factors and food web structure is provided in **Appendix F**.

3.5.2. Terrestrial Plants (TERRPLANT)[18]

TerrPlant was created by the Plant Technology Team and is used by the Environmental Fate and Effects Division (EFED) as a Tier 1 model for ecological risk assessments of pesticides. The model is implemented in Microsoft Excel®. The purpose of TerrPlant is to provide initial estimates of exposure to terrestrial plants from single pesticide applications. The model does not consider exposures to plants from multiple pesticide applications. TerrPlant derives estimated exposure concentrations (EECs) of a pesticide in runoff and in drift. Risk quotients (RQs) are developed for non-listed and listed species of monocots and dicots inhabiting dry and semi-aquatic areas that are adjacent to treatment sites.

TerrPlant incorporates two similar conceptual models for depicting dry and semi-aquatic areas of terrestrial habitats. For both models, a non-target area is adjacent to the target area. Pesticide exposures to plants in the non-target area are estimated to receive runoff and spray drift from the target area. For a dry area adjacent to the treatment area, runoff exposure is estimated as sheet runoff. Sheet runoff is the amount of pesticide in water that runs off of the soil surface of a target area of land that is equal in size to the non-target area (1:1 ratio of areas). For semi-aquatic areas, runoff exposure is estimated as channel runoff. Channel runoff is the amount of pesticide that runs off of a target area 10 times the size of the non-target area (10:1 ratio of areas). Exposures from

[18] *Ibid*

runoff and spray drift are then compared to measures of survival and growth (*e.g.,* effects to seedling emergence and vegetative vigor) to develop RQ values.

3.5.3. Bees (BeeREX)[19]

The Bee-REX model is a screening-level tool that is intended for use in a Tier I risk assessment to assess exposures of bees to pesticides and to calculate risk quotients. This model is individual-based, and is not intended to assess exposures and effects at the colony-level (i.e., for honey bees).

4. ECOLOGICAL EFFECTS CHARACTERIZATION

The effects characterization describes the types of effects a pesticide can produce in aquatic and/or terrestrial organisms. This characterization is based on applicant-submitted studies that describe acute and chronic effects toxicity information for various aquatic and terrestrial animals and plants. A summary of the results of all applicant-submitted toxicity studies used to characterize effects for this risk assessment is provided in **Appendix B**. Given its mode of action as an auxin mimic, the phototoxic effects of florpyrauxifen-benzyl on vascular plants that grow via inter-node elongation are expected to occur at relatively low concentrations; however, effects on single-celled plants, duckweed, and animals are expected to be limited. Toxicity testing reported in this section does not represent all species of birds, mammals, or aquatic organisms. Only a few surrogate species for both freshwater fish and birds are used to represent all freshwater fish (2000+) and bird (680+) species in the United States. For mammals, acute studies are usually limited to Norway rat or the house mouse. Estuarine/marine testing is usually limited to a crustacean, a mollusk, and a fish. Neither reptiles nor amphibians are tested[20]. The risk assessment assumes that freshwater fish serve as a surrogate for aquatic-phase amphibians and that birds serve as a surrogate for the terrestrial-phase amphibians and reptiles.

In addition to the active ingredient and transformation products, two Technical End-Use Products (TEP) containing the TGAI were evaluated. Florpyrauxifen-benzyl was co-formulated with both cyhalofop and penoxsulam, respectively, and these co-formulations were reviewed for vegetative-vigor effects to crops.

For each taxon discussed below, the most-sensitive endpoint will be discussed and used for risk assessment.

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[19] *Ibid*

[20] An acute toxicity test using florpyrauxifen-benzyl TGAI on *Xenopus laevis* tadpoles was recently submitted (MRID # 49931501). This study is currently under review; however, a preliminary screen indicates that no statistically-significant mortality occurred up to the test limit of 0.0676 mg a.i./L, which is similar to results for fish.

4.1. Aquatic Effects

Acute (survival) and chronic (growth and reproduction) studies using both florpyrauxifen-benzyl and related degradation products provided effects data on freshwater and estuarine/marine fish, freshwater, estuarine/marine and benthic invertebrates, as well as vascular and nonvascular aquatic plants (algae/diatoms). Details of the studies focused on most sensitive species within each taxonomic group are presented in the tables located below.

In general, studies using TGAI were solubility limited (~40 - 50 µg/L) in the test system even with the use of a co-solvent, resulting in non-definitive (unbounded ">") endpoints for aquatic animals as well as for non-vascular and non-elongating vascular aquatic plants (*Lemna*). Studies using TEP or a transformation product were not solubility limited, and these studies typically established IC_{50} endpoints in the mg/L range for aquatic animals.

4.1.1. Acute Toxicity to Fish

Acute toxicity tests conducted on fish using florpyrauxifen-benzyl TGAI were solubility limited to ~ 40 - 50 µg/L (with co-solvent), precluding the identification of definitive acute endpoints up to the EEC for the aquatic, in-water use (~150 µg a.i./L; **Table 30**). Consequently, many toxicity endpoints are expressed as ">" the highest test concentration (typically 40-60 µg a.i./L) when no significant effects were reported. Notably, the solubility of the TGAI in water is estimated to be 15 µg a.i./L.

Freshwater fish, including rainbow trout (*Oncorhynchus mykiss*), fathead minnow (*Pimephales promelas*), and common carp (*Cyprinus carpio*) were studied (850.1075) using both florpyrauxifen-benzyl (TGAI, and often TEP) and selected transformation products. All acute (96-h) LC_{50} values for the TGAI are non-definitive (>) and range from >49 µg a.i./L (rainbow trout) to >52 µg a.i./L (fathead minnow; **Appendix B**). With the two TEPs, acute LC_{50} values are still non-definitive (>0.53 to >3.2 mg a.i./L; common carp). This suggests that the acute toxicity to fish (at least for carp) of the active ingredient is well above its native solubility in water. The studies with TEP were particularly relevant for this pesticide because GF-3301 is being proposed for direct application to water. For risk assessment purposes, the "lowest" non-definitive acute LC_{50} of >49 µg a.i./L will be used to represent the acute toxicity of the active ingredient to freshwater fish (**Table 34**). Due to the existence of non-definitive (">") acute toxicity values for all species of freshwater fish tested, a specific acute toxicity classification for florpyrauxifen-benzyl is not available.

The acute LC_{50} values for the transformation products (XDE-848 acid, XDE-848 hydroxy acid, nitro-hydroxy acid, des-chloro XDE-848 BE, des-chloro XDE-848 acid) range from >1.0 mg a.i./L (common carp, des-chloro XDE-848 BE Ester, MRID #49677739) to 120 mg a.i./L (carp/XDE-

848 hydroxy acid, MRID #49677740; **Table 35**). Because the TGAI and TEP acute toxicity endpoint values for freshwater fish were all non-definitive, it was not possible to determine with precision the differences in acute toxicity of the parent chemical relative to these transformation products.

In general, florpyrauxifen-benzyl related compounds produced only sub-lethal effects in fish. Dose related sub-lethal effects (discoloration, lethargy, surfacing) resulting from acute exposure to florpyrauxifen-benzyl occurred as low as 12.3 µg a.i./L (MRID # 49677735).

Estuarine/marine fish are represented by a single TGAI study using Sheepshead Minnow *(Cyprinodon variegatus*), which established an acute LC_{50} of >40.3 µg a.i./L, the approximate limit of solubility (MRID # 49677737). Due to the existence of non-definitive (">") acute toxicity values for estuarine/marine fish, a specific acute toxicity classification for florpyrauxifen-benzyl is not available.

4.1.2. Chronic Toxicity to Fish

Two 33-day early-life stage (ELS) chronic tests (850.1400) were performed on freshwater fish using florpyrauxifen-benzyl and XDE-848 acid, respectively. No statistically-significant effects on fish survival or growth were observed in these studies up through the highest treatment tested. Chronic testing with florpyrauxifen-benzyl established a NOAEC of 37.3 µg a.i./L and an unbounded LOAEC of >37.3 µg a.i./L (MRID #49677747, (**Table 34**). No statistically-significant sub-lethal effects were noted. However, it should be noted that clinical signs of toxicity were observed during the study, including: one fish in the vehicle control on day 12, one fish from the 2.97 µg a.i./L treatment on day 10, one to three fish in the 6.08 µg a.i./L treatment on days 7 to 10, and in one fish in the 12.7 µg a.i./L treatment on day 7. One fish was observed with spinal curvature in the 620 µg a.i./L treatment from day 7 to 11. Chronic testing with XDE-848 acid established a NOAEC of 29.8 mg a.i./L and an unbounded LOAEC of > 29.8 mg a.i./L (MRID #49677748, Table 4.2).

Data on the chronic toxicity of florpyrauxifen-benzyl to estuarine/marine fish were not submitted to the Agency, which represents a data gap according to its use pattern and 40 CFR Part 158.

Table 34. Most sensitive acute and chronic toxicity endpoints Fish tested with florpyrauxifen-benzyl TGAI or TEP

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / (Acute Toxicity Classification)	MRID *(Classification)*	Notes
Fres wate	96-Hour Acute /	Rainbow Trout	*Survival*	49677735	Sub-lethal effects (discoloration) were

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / (Acute Toxicity Classification)	MRID *(Classification)*	Notes
	TGAI	(*Oncorhynchus mykiss*) 850.1075	LC_{50} >49 µg a.i./L (N.A.)[1]	(*Supplemental - quantitative*)	observed at the 12.3 ppb, 24.1 ppb and 49 ppb levels.
	33-Day Chronic (ELS) / TGAI	Fathead Minnow (*Pimephales promelas*) 850.1400	*All*[2] NOAEC: 37.3 µg a.i./L LOAEC >37.3 µg a.i./L	49677747 (*Supplemental - quantitative*)	The highest concentration level was significantly below the proposed rate of 150 ppb
Estuarine / Marine Fish	96-Hour Acute / TGAI	Sheepshead Minnow *(Cyprinodon variegatus)*	*Survival* LC_{50} >40.3 µg a.i./L (N.A.)[1]	49677737 (*Supplemental - quantitative*)	The highest concentration level was significantly below the proposed rate of 150 ppb.
	Chronic / NA	NA	NA	***Study Not Submitted***	

1. *Acute toxicity classification cannot be precisely determined due to non-definitive (">") endpoint.*
2. *All endpoints in this study were the same value.*

Table 35. Acute and Chronic Toxicity of florpyrauxifen transformation products to Freshwater Fish

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / (Acute Toxicity Classification)	*MRID (Classification)*	Notes
Freshwater Fish	96-Hour Acute / Nitro-Hydroxy Acid X12483137	Common Carp (*Cyprinus carpio*) 850.1075	*Survival* LC_{50} >9.6 mg/L (N.A.)[1]	49677743 *(Acceptable)*	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	96-Hour Acute / Acid X11438848	Rainbow Trout (*Oncorhynchus mykiss*) 850.1075	*Survival* LC_{50} >99.4 mg a.i./L (N.A.)[1]	49677741 *(Acceptable)*	No dose-related mortality or sub-lethal effects were recorded.
	96-Hour Acute / Hydroxy Acid X11966341	Common Carp (*Cyprinus carpio*) 850.1075	*Survival* LC_{50} >120 mg a.i./L **Practically Non-Toxic**	49677740 *(Acceptable)*	Limit Test: No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	96-Hour Acute / Des-Chloro-Acid X12393505	Common Carp (*Cyprinus carpio*) 850.1075	*Survival* LC_{50} >90 mg a.i./L (N.A.)[1]	49677738 *(Acceptable)*	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / (Acute Toxicity Classification)	*MRID (Classification)*	Notes
	96-Hour Acute / Des-chloro XDE-848 BE X12131932	Common Carp (*Cyprinus carpio*) 850.1075	*Survival*[1,2] LC_{50} >1.0 mg a.i./L (N.A.)[1]	49677739 *(Acceptable)*	Limit Test: No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	33-Day Chronic / Acid X11438848	Fathead Minnow (*Pimephales promelas*) 850.1400	*All*[3] NOAEC: 29.8 mg a.i./L LOAEC >29.8 mg a.i./L	49677748 *(Acceptable)*	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.

1. *Acute toxicity classification cannot be precisely determined due to non-definitive (">") endpoint.*
2. *Transformation product* X12131932 *produced a lower endpoint value, but it is not considered a stressor of concern based upon exposure analysis.*
3. *All endpoints in this study were the same value.*

4.1.3. Toxicity to Aquatic Invertebrates

As seen with fish (above), acute toxicity studies conducted on aquatic invertebrates using florpyrauxifen-benzyl were often solubility limited to ~ 40-60 µg a.i./L (with co-solvent), precluding the identification of definitive test acute endpoints up to the EEC (150 µg a.i./L). Consequently, many toxicity endpoints are expressed as ">" the highest test-concentration even when no significant effects were reported. Conversly, test concentrations using TEP or a degradation product were not solubility limited. Chronic studies established significant (statistical and/or biological) effects established in two studies. In the sub-chronic midge (MRID #49677750) and chronic mysid (MRID #49677746) studies, statistically-significant adverse effects were observed **at all treatment levels**, resulting in a non-definitive less-than ("<") NOAEC and a LOAEC values at the lowest test concentration of each test (**Appendix, B)**.

4.1.3.1. Acute Toxicity to Freshwater Invertebrates (Water Column Exposure)

48-hour and 96-hour acute toxicity tests on four species of freshwater invertebrates, water flea (*Daphnia magna*), midge (*Chironomus riparius*), scud (*Gammarus pseudolimnaeus*), snail (*Lymnaea stagnali*) (850.1010, 850.1020), using florpyrauxifen-benzyl (TGAI/TEP) were submitted (**Table 36**, **Appendix B**). The acute toxicity of florpyrauxifen-benzyl (TGAI/TEP), ranged from >41.9 µg a.i./L (TGAI, *Gammarus*, MRID 49677731) to 1.32 mg a.i./L (TEP GF-3206, *Daphnia,* MRID# 49677909). Of note, this *Daphnia* study (MRID #49677909) was the only definitive acute study for this taxa.

These data indicate that florpyrauxifen-benzyl is not acutely toxic to freshwater invertebrates up to ~50 µg a.i./L and that TEP toxicity data are particularly relevant to evaluation of the aquatic use of florpyrauxifen-benzyl. For risk assessment purposes, the "lowest" non-definitive acute LC_{50} of >41.9 µg a.i./L (*Gammarus*, MRID# 49677731) was used to represent the acute toxicity of florpyrauxifen-benzyl to freshwater invertebrates via water-column exposure. Lowering the application rate to the lowest LC_{50} value (~42 ppb) would reduce uncertainity for acute risks to these species.

4.1.3.2. Acute Toxicity to Estuarine/Marine Invertebrates (Water Column Exposure)

96-hour acute toxicity effects on two species of estuarine/marine invertebrates, eastern oyster (*Crassostrea virginica*) and mysid shrimp (*Americamysis bahia*), were studied using florpyrauxifen-benzyl (both TGAI and in TEP). Results ranged from a 96-h EC_{50} of >270 µg a.i./L (oyster, TEP, MRID# 496778010) to a 96-h LC_{50} of >370 µg a.i./L (mysid, TEP, MRID# 496778011; **Table 35**).

4.1.4. Chronic Toxicity to Aquatic Invertebrates

4.1.4.1. Chronic Toxicity to Freshwater Invertebrates (Water Column Exposure)

Chronic testing on freshwater species was accomplished via two 21-day chronic tests (850.1300) performed on *Daphnia magna* using florpyrauxifen-benzyl and XDE-848 acid, respectively. The most-sensitive endpoint from testing with florpyrauxifen-benzyl was a NOAEC of 38.5 µg a.i./L / LOAEC >38.5 µg a.i./L (MRID #49677744, **Table 36**). The most-sensitive endpoint from testing with XDE-848 acid was a NOAEC of 25.9 mg a.i./L / LOAEC of 52.9 mg a.i./L (MRID #49677745, **Table 37**).

4.1.4.2. Chronic Toxicity to Estuarine/Marine Invertebrates (Water Column Exposure)

For chronic testing on estuarine/marine invertebrates, a single a 28-day life-cycle chronic test (850.1350) was performed on mysid shrimp (*A. bahia*) using only florpyrauxifen-benzyl TGAI (MRID # 49677746, **Table 36**). This study established a chronic LOAEC of 1.1 µg a.i./L and a NOAEC of <1.1 µg a.i./L based on a statistically-significant reduction (3-5%) in female length at the lowest test concentration. Since statistically-significant effects were noted at every test concentration, a definitive NOAEC could not be determined. Similarly, at the lowest test concentration of 1.1 µg a.i./L (LOAEC), mysid reproduction (# young/female/day) was reduced 21% relative to controls, and while these results were not statistically significant (p value >0.05) - they were considered to be <u>biologically significant</u>. Moreover, reproduction was reduced from 16% to 46% across all test concentrations.

4.1.4.3. Chronic Toxicity to Sediment Dwelling (benthic) Invertebrates

Two sediment toxicity studies of florpyrauxifen-benzyl were submitted for the freshwater midge (*Chironomus dilutus*, a.k.a. Harlequin fly), including a 10-day sub-chronic exposure study (850.1735) using spiked sediment and a 28-day sub-chronic study (with both TGAI and XDE-848 acid, OECD guideline 219) using spiked water. It is noted that while the OECD 219 study is considered chronic by OECD guidelines, it does not include effects on reproduction and thus, is not considered a full chronic (life cycle) study per 40 CFR Part 158, Subpart G based (on the use and environmental fate properties of florpyrauxifen-benzyl).

In the 10-day spiked sediment study using florpyrauxifen-benzyl (MRID #49677750, Table 4.3) statistically-significant adverse effects on ash-free dry weight (AFDW) were documented (reduced 10% to 33%), which resulted in an unbounded NOAEC of <4.32 µg a.i./L in pore-water. No statistically-significant effect on survival was established.

As mentioned above, a 28-day OECD-219 guideline based study (MRID# 49677804), was also conducted using florpyrauxifen-benzyl TGAI, *via spiked-water*, on midge (*Chironomus riparius*) larvae. While both the EPA and OECD studies reported survival endpoint values, the OECD study did not record dry weight or ash-free dry weight data. Furthermore, by design, the OECD study did not measure effects on reproduction, which may lead to underestimation of the chronic effects of florpyrauxifen-benzyl on midge. Consequently, the data from the OECD study are classified as supplemental.

A chronic toxicity, whole-sediment test using florpyrauxifen hydroxy benzyl ester (X12300837, MRID # 50017201) on *Chironomus riparius* was recently submitted. This study is currently under review; however, an initial screening indicated that no statistically-significant effects to emergence, development or survival were reported (to be verified). A similar study using florpyrauxifen hydroxy-acid (X11966341, MRID# 50017202) was also conducted. This study is also currently under review; however, an initial screening indicated that male emergence was significantly delayed at the 350 mg/kg level and that no statistically-significant effects to development or survival were reported (to be verified).

Table 36. Most Sensitive Acute and Chronic Toxicity Endpoints Used for Risk Estimation with Aquatic Invertebrates.

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / (Acute Toxicity Classification)	MRID *(Classification)*	Notes
Freshwater Invertebrates	96-Hour Acute / TGAI	Scud (*Gammarus pseudolimnaeus*) 850.1020	*Survival* LC_{50} >41.9 µg a.i./L (N.A.)[1]	49677731 (*Acceptable*)	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	21-Day Chronic / TGAI	Water flea (*Daphnia magna*) 850.1300	*1st Brood Release, Young / Adult, Length, Reproduction* NOAEC: 38.5 µg a.i./L LOAEC >38.5 µg a.i./L	496777744 (*Supplemental - quantitative*)	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
Marine Invertebrates	96-Hour Growth / TEP	Eastern Oyster (*Crassostrea virginica*) 850.1025	*Survival, Shell Growth* EC_{50} >270 µg a.i./L (N.A.)[1] (unbounded)	496778010 (*Acceptable*)	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	28-Day Chronic (Life Cycle) / TGAI	Mysid Shrimp (*Americamysis bahia*) 850.1350	*Female Length,* NOAEC <1.1 µg a.i./L LOAEC: 1.1 µg a.i./L	49677746 (*Acceptable*)	Statistically-significant reduction of female body length and offspring/ female at all concentrations
Benthic Invertebrates	10-Day Whole Sediment / TGAI	Midge (*Chironomus dilutus*) 850.1735	*Ash-free Dry Weight* Pore-water NOAEC: <4.32 *(*µg a.i./L*)* Pore-water LOAEC: 4.32 *(*µg a.i./L*)* Sediment NOAEC: <5.25 (mg a.i./kg) Sediment LOAEC: 5.25 (mg a.i./kg)	49677750 (*Acceptable*)	Statistically-significant reduction of ash-free dry weight at all concentrations
			Survival Pore-water NOAEC: 34.6 *(*µg a.i./L*)* Pore-water LOAEC: >34.6 *(*µg a.i./L*)* Sediment NOAEC: 83.2 (mg a.i./kg) Sediment LOAEC: >83.2 (mg a.i./kg)		

1. Acute toxicity classification cannot be precisely determined due to non-definitive (">") endpoint.

Table 37. Acute and chronic toxicity of florpyrauxifen-benzyl transformation products to aquatic invertebrates

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / Acute Toxicity Classification	*MRID (Classification)*	*Notes*
Freshwater Aquatic Invertebrates	48-Hour Acute / Nitro-Hydroxy Acid X12483137[2]	Water Flea (*Daphnia Magna*) 850.1010	*Survival* EC_{50} >10.0 mg/L (N.A.)[1]	49677730 (*Acceptable*)	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	48-Hour Acute / Acid X11438848	Water flea (*Daphnia magna*) 850.1010	*Mortality* EC_{50} >91.8 mg a.i./L (N.A.)[1]	49677726 (*Acceptable*)	Statistically-significant, dose-related immobility at the highest level. No sub-lethal effects were recorded.
	48-Hour Acute / Hydroxy Acid X11966341	Water flea (*Daphnia magna*) 850.1010	*Mortality* EC_{50} >100 mg a.i./L **Practically Non-Toxic**	49677727 (*Acceptable*)	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	48-Hour Acute / Des-Chloro-Acid X12393505	Water flea (*Daphnia magna*) 850.1010	*Mortality* EC_{50} >110 mg a.i./L **Practically Non-Toxic**	49677728 (*Acceptable*)	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	48-Hour Acute / Des-chloro BE Ester X12131932	Water flea (*Daphnia magna*) 850.1010	*Mortality* EC_{50} >0.98 mg a.i./L (N.A.)[1]	49677729 (*Acceptable*)	No statistically-significant, dose-related mortality or sub-lethal effects were recorded.
	21-Day Chronic / Acid X11438848	Water Flea (*Daphnia Magna*) 850.1300	*Reproduction* NOAEC: 25.9 mg/L LOAEC: 52.9 mg a.i./L	49677745 (*Acceptable*)	Reproduction was effected at the highest level (52.9 mg a.i./L).

1. Acute toxicity classification cannot be precisely determined due to non-definitive (">") endpoint 4.2.

4.2. Effects to Aquatic Plants

4.2.1. Toxicity Non-Vascular Aquatic Plants

Freshwater non-vascular aquatic plants were studied in 96-hour static tests and were represented by a single species from each of three large taxonomic groups: freshwater green algae (*Pseudokirchneriella subcapitata*), freshwater blue-green algae (*Anabaena flos-aquae*), and freshwater diatoms (*Navicula pelliculosa*). *P. subcapitata* was studied using florpyrauxifen-benzyl, both as TGAI and in TEP (GF-3206 & GF-3301) as well as XDE-848 acid. *A. flos-aquae* was studied using only TGAI. *N. pelliculosa* was studied using florpyrauxifen-benzyl and multiple transformation products.

Studies using florpyrauxifen-benzyl resulted in toxicity values for non-vascular aquatic plants ranging from IC_{50} >38.9 µg a.i./L, (NOAEC = 12.4 µg a.i./L) - the most sensitive endpoint, using the estuarine/marine diatom *Skeletonema costatum* (MRID #49677766, **Table 38)** to 5.58 mg a.i./L using TEP GF-3206 on *P. subcapitata*, a green alga, (MRID# 49677912, **Appendix B**).

Studies using transformation products resulted in IC_{50} endpoint values ranging from >1.30 mg/L using des-chloro XDE-848 benzyl ester (*N. pelliculosa*, MRID #49677773, however this transformation product is not considered a stressor of concern in this assessment) to 75.85 mg/L using XDE-848 acid (*P. subcapitata*, MRID #49677769; **Appendix B**).

Table 38. Most sensitive endpoint data for Non-Vascular Aquatic Plants tested with florpyrauxifen-benzyl

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value	*MRID (Classification)*	*Notes*
Freshwater Non-Vascular Aquatic Plants	96-Hour Acute / TGAI	*Blue-green algae (Anabaena flos-aquae)*	*Cell Density, Yield* 96-h IC_{50} >51.3 µg a.i./L NOAEC: 28.5 µg a.i./L	49677774 *(Acceptable)*	Cell density & yield were effected at the highest level (51.3 µg/L).
Estuarine/ Marine Non-Vascular Plants	96-Hour Acute / TGAI	Marine Diatom (*Skeletonema costatum*)	*Yield* 96-h IC_{50} >38.9 µg a.i./L NOAEC: 12.4 µg a.i./L	49677766 (*Supplemental - quantitative*)	Cell density & yield were effected at the two highest levels.

4.2.2. Toxicity to Vascular Aquatic Plants

Florpyrauxifen-benzyl was tested on four surrogate aquatic plant species: the floating duckweed (*Lemna gibba,* 7-day study) and three submerged aquatic vegetation species (SAVs): Eurasian Watermilfoil (*Myriophyllum spicatum*), Carolina fanwort (*Cabomba caroliniana*), and Coontail (*Ceratophyllum demersum*), in 14-day studies. Overall, florpyrauxifen-benzyl demonstrated greater toxicity (low ng/L range) than the acid-form (mid to high ng/L range), which in-turn demonstrated greater toxicity than any of the other transformation products (low µg/L to low mg/L range). Studies conducted on Duckweed (*Lemna gibba*), established IC_{50} inhibition endpoints in the ng/L to µg/L range.

Duckweed is a free-floating aquatic vascular plant that does not elongate, so effects of florpyrauxifen-benzyl (a synthetic auxin mimic) are not expected to be at low levels compared to elongating aquatic vascular plants. While duckweed was tested using florpyrauxifen-benzyl (both TGAI and TEP (GF-3206)), it was not tested with a transformation product. This testing established a IC_{50} of 26.27 mg a.i./L, and NOAEC = 5.9 mg a.i./L (MRID# 49677911).

Eurasian watermilfoil, Carolina fanwort, and Coontail, were tested using both florpyrauxifen-benzyl and XDE-848 acid. Eurasian watermilfoil was also studied using transformation products (benzyl hydroxy, hydroxy acid, des-chloro BE, and des-chloro acid, see **Appendix L** for complete data). These studies were conducted using OECD Draft Guideline: *Water-Sediment Myriophyllum sp. Toxicity Test based on Draft AMRAP Method: Growth Inhibition Test for the Rooted Aquatic Macrophyte, Myriophyllum sp*. The fourteen-day toxicity endpoint values using florpyrauxifen-benzyl on SAVs ranged from an EC_{50} of 0.0162 µg a.i./L, NOAEC of 0.00483 µg a.i./L (*total shoot length*, TGAI, *Myriophyllum*, MRID #49677805, **Table 39**) to an EC_{50} of 4.52 µg a.i./L, NOAEC of 1.42 µg a.i./L (*dry weight*, *Ceratophyllum*, MRID #49677815, study under review; **Appendix B**). The *Myriophyllum* results (MRID #49677805) were the lowest endpoint values submitted for review and are used for risk estimation in this assessment. Complete toxicity endpoint results for aquatic plants can be found in **Appendix L**.

In 14-day toxicity endpoint values using transformation products, values on SAVs ranged from an EC_{50} of 0.497 µg/L, NOAEC of 0.115 µg/L (XDE-848 acid, *Myriophyllum,* MRID #49677806) to an EC_{50} of 11.1 mg/L, NOAEC of 0.954 mg/L (florpyrauxifen nitro-hydroxy acid, *Myriophyllum*, MRID #49677813; **Table 39** and **Appendix B**).

In summary, compared to florpyrauxifen-benzyl, the relative toxicity of the transformation products on SAVs:

- florpyrauxifen-acid was 30x less toxic
- the benzyl-hydroxy (X12300837) was 1,700x less toxic
- the hydroxy-Acid (X11966341) was 11,400x less toxic

Table 39. Most sensitive endpoint data for Freshwater Vascular Aquatic Plants tested with TGAI or Transformation Product

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / Acute Toxicity Classification	MRID *(Classification)*
Freshwater Vascular Plants	14-day Acute (OECD) / TGAI	Eurasian Watermilfoil (*Myriophyllum spicatum*) / OECD	*Total Shoot Length* IC_{50} = 0.0162 µg a.i./L *All* NOAEC: 0.00483 µg a.i./L LOAEC: 0.013 µg a.i./L	49677805 (*Acceptable*)

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / Acute Toxicity Classification	MRID *(Classification)*
	14-day Acute (OECD) / Acid X11438848	Eurasian Watermilfoil (*Myriophyllum spicatum*) / OECD	*Total Shoot Length, Fresh Weight* IC_{50} = 0.497 µg/L NOAEC: 0.115 µg/L LOAEC: 0.458 µg/L	49677806 (*Acceptable*)

4.3. Effects to Terrestrial Animals

In general, terrestrial invertebrates (bees), birds and mammals exhibited little to no measured toxic effects when tested with florpyrauxifen-benzyl.

4.3.1. Terrestrial Invertebrates (Bees)

Bees (honey bee, *Apis mellifera*) were limit-tested for acute (48-hour) effects using both oral and contact dosing with florpyrauxifen-benzyl following OECD guidelines OECD-213 and OECD-214.[21] This acute test established a contact LC_{50} value of >100 µg a.i./bee (MRID# 49677757, **Table 40**). Although oral testing is currently not required in the CFR 40 Part 158 guidelines, this test established an oral LC_{50} value of >105.4 µg a.i./bee (also MRID# 49677757, **Table 40**). Though no statistically-significant lethal or sub-lethal effects were observed, two bees in the treatment group were observed to be affected (coordination problems, apathy) after 4 hours, and mortality was 2% and 4% after 24-hr. and 48-hr., respectively. At the 24- and 48-hour observation periods, all surviving honey bees appeared normal and healthy. Florpyrauxifen-benzyl is classified as 'practically nontoxic' to terrestrial invertebrates on an acute exposure basis.

Chronic honeybee studies using florpyrauxifen-benzyl (or transformation products) were not submitted.

[21] At China's request, a second bee limit-study (MRID# 49931602) was conducted to determine both contact and oral mortality endpoints. This study is currently under review; however, an initial review of the data indicates that no statistically-significant mortality occurred at the 200 ug/Bee contact-dose level, or at the 212.5 ug/Bee oral-dose levels.

Table 40. Most sensitive endpoint data for Terrestrial Invertebrates (Bees) tested with florpyrauxifen-benzyl or TEP

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / Acute Toxicity Classification	MRID *(Classification)*
Bees	48-hr. Oral / TGAI	Honey Bee *(Apis mellifera)* OECD 213, 214	*Survival (Oral)* LD_{50} >105.4 µg a.i./Bee **Practically Non-Toxic**	49677757 (*Acceptable*)
	48-hr. Contact / TGAI	Honey Bee *(Apis mellifera)* OECD 213, 214	*Survival (Contact)* LD_{50} >100 µg a.i./Bee **Practically Non-Toxic**	49677757 (*Acceptable*)

4.3.2. Birds

Three species of birds, including zebra finch (*Taeniopygia guttata*), bobwhite quail (*Colinus virginianus*), and mallard duck (*Anas platyrhynchos*) were tested for acute (14-day oral and 8-day diet) effects using florpyrauxifen-benzyl. Bobwhite quail and mallard duck were also studied for chronic effects.

Bobwhite quail and zebra finch established identical unbounded (high-end) acute oral LD_{50} values of >2,250 mg/kg bw (MRID #49677751 and 49677752, respectively, **Table 41**). Similarly, bobwhite quail and mallard duck established identical acute dietary LC_{50} values of >5,640 mg/kg diet (MRID #49677753 and 49677754, respectively, **Table 41**). Consequently, florpyrauxifen-benzyl is considered "practically non-toxic" to birds on an acute exposure basis. Toxicity data on transformation products were not submitted.

In a chronic reproduction study with bobwhite quail, mean food consumption (g/bird/day) was significantly reduced, establishing a NOAEC of 398 mg a.i./kg diet / LOAEC of 999 mg a.i./kg diet (MRID# 49677755). However, reductions in growth and reproduction were not statistically-significant.

Table 41. Most sensitive endpoint data for Birds tested with a florpyrauxifen-benzyl or TEP

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / Acute Toxicity Classification	MRID *(Classification)*
Birds	14-Day Acute Oral / TGAI	Bobwhite (*Colinus virginianus*) 850.2100	*Survival* LD_{50} >2,250 mg a.i./kg bw **Practically Non- Toxic** (unbounded)	49677751 (*Acceptable*)

	8-Day Acute Diet / TGAI	Mallard (*Anas platyrhynchos*) 850.2200	*Survival* LC_{50} >5,640 mg a.i./kg diet **Practically Non- Toxic** (unbounded)	49677754 (*Acceptable*)
	21-Week Reproduction / TGAI	Bobwhite (*Colinus virginianus*) 850.2300	*Mean Food Consumption* NOAEC: 398 mg a.i./kg-diet LOAEC: 999 mg a.i./kg-diet	49677755 (*Acceptable*)

4.3.3. Mammals

Acute oral studies using florpyrauxifen-benzyl were conducted on rats (*Rattus norvegicus*). These studies established unbounded (high-end) endpoints of >5,000 mg a.i./kg bw (MRID# 49677703, **Table 42**). No adverse parental, reproductive, or adverse effects on offspring were observed in the chronic 2-generation reproduction study in rats at the kinetically derived maximum dose (300 mg/kg/day) (MRID# 49677855). Consequently, florpyrauxifen-benzyl is classified as "practically non-toxic" to mammals on an acute exposure basis. Toxicity to transformation products could not be classified.

Table 42. Most sensitive endpoint data for Mammals tested with a florpyrauxifen-benzyl

Taxon	Format / Material	Species / Guidance	*Variable* / Toxicity Value / Acute Toxicity Classification	MRID *(Classification)*
Mammals	Acute Oral / TGAI	Rat (*Rattus norvegicus*) (Winstar)	*Survival* LD_{50} >5,000 mg a.i./kg bw / **Practically Non- Toxic** (unbounded)	49677703 (*Acceptable*)
	Chronic 2-Generation Reproduction / TGAI	Rat (Rattus norvegicus) (Winstar)	NOAEL: 300 mg/kg-bw/day LOAEL: >300 mg/kg-bw/day	49677855 (*Acceptable*)

4.4. Effects to Terrestrial Plants

Studies using florpyrauxifen-benzyl, and its degradations products, on terrestrial plants (crops) indicated that effects occur at levels several orders of magnitude below proposed application rates. Monocots (corn, oat, onion, and ryegrass) and dicots (carrot, cucumber, oilseed rape, soybean, sugar beet, and sunflower) were tested in Tier II seedling emergence and vegetative vigor studies using both florpyrauxifen-benzyl TEP (GF-3206) and florpyrauxifen-acid. Testing using other transformation products (for both emergence and vegetative vigor) was limited to dicots (carrot, cucumber, oilseed rape, soybean, sugar beet, and sunflower). Results of the Tier II seedling studies showed that application rates ~1,100x below the maximum application rate for florpyrauxifen-benzyl (in TEP) produced a twenty-five percent, or more, inhibition of the most sensitive terrestrial plants (crops). The most sensitive endpoint from testing with florpyrauxifen-benzyl was an IC_{25} of 0.0000469 lb./A (NOAEC = 0.000014 lb./A) (MRID # 49677762, Vegetative Vigor with GF-3206), shown in **Table 43**.

On a crop-by-crop basis: The vegetative vigor study using florpyrauxifen-benzyl (GF-3206) indicated that soybean, carrot and sunflower were the most sensitive while cucumber, sugar beet were ~10x less effected; ryegrass, corn and oilseed rape were ~1000x less effected. Finally, oat did not achieve a definitive EC_{25} in this study (see, **Appendix K**).

Similarly, a vegetative vigor study using florpyrauxifen-acid indicated that soybean and carrot were most effected by that transformation product, while cucumber and sunflower were ~10x less effected; oilseed rape, sugar beet and onion were ~100x less effected. Finally, corn, oat and ryegrass toxicity endpoints were not calculable. For additional terrestrial plant toxicity data, see **Appendix K**. For additional review of toxicity, including spray drift analysis, see section 5.2.4.

Three trends were evident:

1. Florpyrauxifen-benzyl was approximately 10x more phytotoxic than florpyrauxifen-acid. In turn, florpyrauxifen-acid was at least 180x more toxic than the other transformation products (see **Appendix K**).
2. Dicots were usually more sensitive than Monocots to both florpyrauxifen-benzyl (up to 100x) and florpyrauxifen-acid (>10x) (see **Appendix K**).
3. Vegetative vigor studies established ~100x lower endpoint values than seedling emergence studies for dicots (monocot endpoints were similar for both types of studies) (**Appendix K**).

While drift-based exposure to crops from rice-use aerial applications is expected, incidental drift from the foliar in-water use is also plausible. Furthermore, because the foliar application is ~2x more concentrated than the rice application, drift of this formulation may result in increased exposure to crops, over a larger area compared the rice use alone.

Table 43. Most sensitive endpoint data for Vascular Terrestrial Plants tested with TEP

Taxon	**Format / Material**	**Species / Guidance**	***Parameter* / Toxicity Value / Acute Toxicity Classification**	**MRID *(Classification)***	**Notes**
Terrestrial Plants	21-Day Seedling Emergence / GF-3206	Dicot: Carrot (*Daucus carota*) 850.4100	*Survival* IC_{25} = 0.002541 lbs. a.i./A NOAEC = 0.0013 lbs. a.i./A	49677759 *(Supplemental-quantitative)*	
		Monocot: Onion (*Allium cepa*) 850.4100	*Dry weight* IC_{25} = 0.00617 lbs. a.i./A NOAEC: 0.0034 lbs. a.i./A		

Taxon	Format / Material	Species / Guidance	*Parameter* / Toxicity Value / Acute Toxicity Classification	MRID *(Classification)*	Notes
	21-Day Vegetative Vigor / GF-3206	Dicot: Soybean (*Glycine max*) 850.4150	*Dry Weight* IC_{25} = 0.0000469 lb. a.i./A NOAEC: 0.000014 lb. a.i./A	49677762 *(Acceptable)*	
		Monocot: Onion (*Allium cepa*) 850.4150	*Dry Weight* IC_{25} = 0.00415 lb. a.i./A NOAEC: 0.0034 lb. a.i./A		

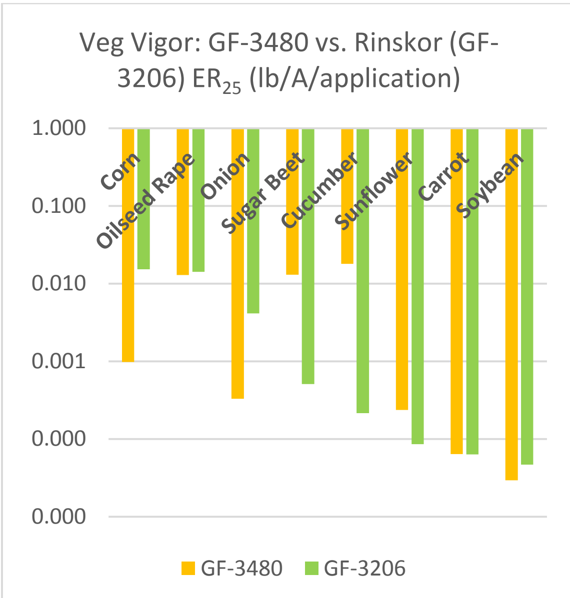
Table 44. Most sensitive endpoint data for Vascular Terrestrial Plants tested with a florpyrauxifen-benzyl transformation product

Taxon	Format / Material	Species / Guidance	Toxicity Value / Acute Toxicity Classification	MRID *(Classification)*	Notes
Terrestrial Plants	21-Day Seedling Emergence / Acid X11438848	Dicot: Carrot *(Daucus carota)* 850.4100	*Survival*[1] IC_{25} = 0.000931 lbs./A NOAEC = 0.00054 lbs./A	49677760 *(Acceptable)*	
		Monocot: Onion (*Allium cepa*) 850.4100	*Survival*[1] IC_{25} = 0.0129 lbs./A IC_{05} = 0.000221 lbs./A.		
	21- Day Vegetative Vigor / Acid X11438848	Dicot: Soybean (*Glycine max*) 850.4150	*Dry Weight* IC_{25} = 0.000389 lb./A NOAEC: 0.00022 lb. /A	49677763 (*Acceptable*)	
		Monocot: Onion (*Allium cepa*) 850.4150	*Dry Weight* IC_{25} = 0.0364 lb./A NOAEC: 0.023 lb./A		

The lowest LC_{50}, EC_{50}, IC_{50}, IC_{25} (terrestrial plants) or NOAEC values will be used to assess the risk of florpyrauxifen-benzyl to these taxa.

Effects of Co-formulations to Terrestrial Plants

Florpyrauxifen-benzyl has been co-formulated with cyhalofop, an aryloxyphenoxy-propionate herbicide (WSSA Group 1 compound): GF-3480 (20 g/L florpyrauxifen-benzyl + 100 g/L cyhalofop-butyl), and a screening-level review of toxicity to crops from exposure to GF-3480 was performed. Fresh-weight ER_{25} GF-3480 vegetative vigor values (MRID# 49931707 / DAS Study # 150167) were compared to dry-weight IC_{25} GF-3206 vegetative-vigor values (florpyrauxifen-benzyl only, MRID# 496777762) on a crop-by-crop basis[1,2]. Corn and onion exhibited greater sensitivity to the co-formulated solution (in florpyrauxifen-benzyl mass a.i./unit area equivalents) ~16x and ~13x respectively, than to florpyrauxifen-benzyl alone. Soybean, oilseed rape and carrot exhibited similar sensitivity to both products. Finally, soybean was the most sensitive crop for both formulations. (**Figure 9a and b**)



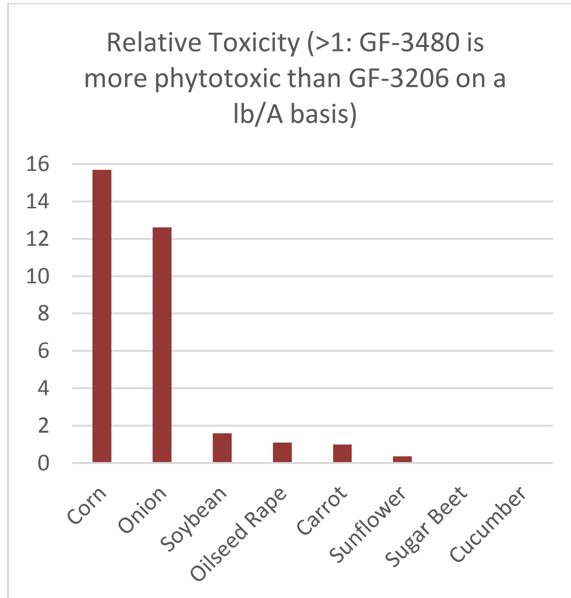
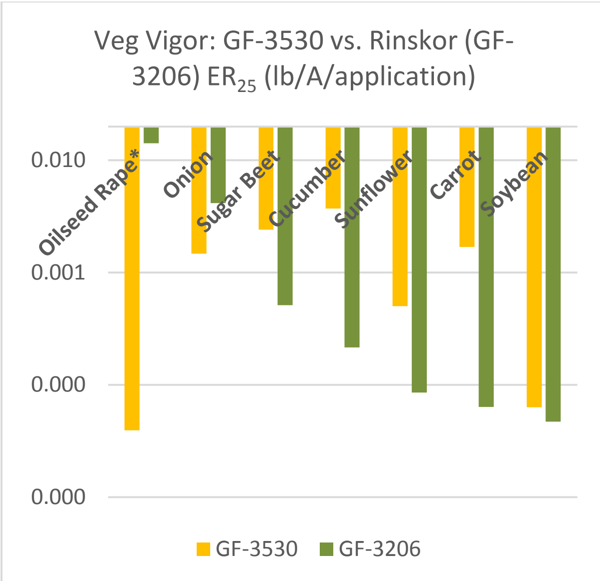


Figure 9. Vegetative vigor endpoint values of GF-3480 compared to GF-3206 and relative toxicity of these formulations

1 Due to an absence of effects data; sorghum and oats could not be compared.
2 GF-3206 may be used twice per growing season, however GF-3480 is limited to one application per growing season.

Florpyrauxifen-benzyl has also been co-formulated with penoxsulam, a triazolopyrimidine herbicide (WSSA group 2 compound): GF-3530 (12.5 g/L florpyrauxifen-benzyl + 20 g/L penoxsulam). Although at this time EFED does not have plant toxicity data for GF-3530, which is the planned formulation for marketing in the U.S., data are available for a formulation with a very similar composition: GF-3565 (13 g/L florpyrauxifen-benzyl + 20 g/L penoxsulam). A screening-level review of toxicity to crops due to exposure to GF-3530 was performed. Specifically, fresh-weight ER_{25} GF-3530 vegetative vigor values (MRID# 50005702 / DAS Study # 150171) were compared to dry-weight IC_{25} GF-3206 vegetative-vigor values (florpyrauxifen-benzyl only, MRID# 496777762) on a crop-by-crop basis[3,4]. Of seven crops compared, only oilseed rape exhibited significantly greater sensitivity to the co-formulated solution (in florpyrauxifen-benzyl mass a.i./unit area equivalents), ~361x, greater than to florpyrauxifen-benzyl alone (**Figures 10a and b**).



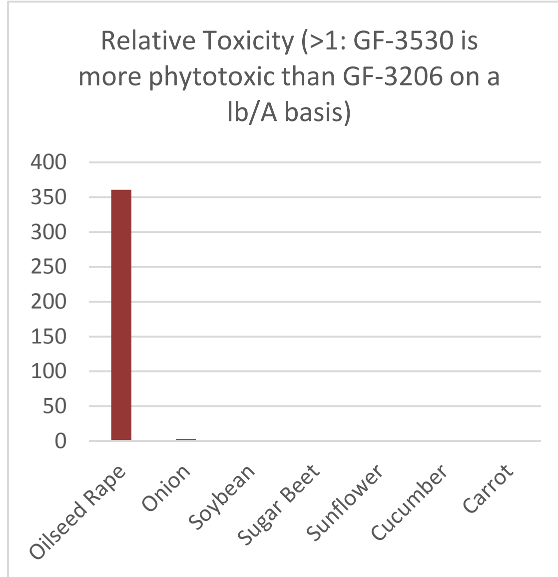


Figure 10. Vegetative vigor of GF-3530 compared to GF-3206 and relative toxicity of these formulations

1 Due to an absence of effects data; corn, ryegrass and oats could not be compared.
2 GF-3206 may be used twice per growing season, however GF-3530 is limited to one application per growing season.

5. RISK CHARACTERIZATION

Risk characterization is the final step in the risk assessment process. Here, exposure and effects characterization are integrated to provide an estimate of risk, the Risk Quotient, which is then compared to established levels of concern (LOCs). The results of this comparison are then interpreted for the risk manager in a narrative risk-description and conclusion sections (**Section 5.2**). The risk-description also contains a discussion of relevant sources of uncertainty in the risk assessment and sensitivity of the risk assessment findings to important methodological assumptions.

5.1 Risk Estimation – Integration of Exposure and Effects Data

Risk characterization integrates EECs and toxicity estimates and evaluates the likelihood of adverse ecological effects to non-target species. For florpyrauxifen-benzyl, a deterministic approach was used to evaluate the likelihood of adverse ecological effects to non-target species. In this approach, Risk Quotients (RQs) are calculated by dividing EECs by acute or chronic eco-toxicity values for non-target species.

Risk Quotient (RQ) = Exposure Estimate (EEC) / Toxicity Estimate (ex. LC_{50})

RQs are then compared to the Agency's LOCs for exceedance for potential risk to both listed and non-listed species, and the need to consider regulatory action. LOC exceedance is interpreted to mean that the labeled use (or proposed use) of the pesticide has the potential to cause adverse effects on non-target organisms in proportion to the exceedance. LOCs currently address the following risk presumption categories:

Animals:

- acute risk - potential for acute risk to non-target organisms which may warrant regulatory action in addition to restricted use classification,
- acute risk, restricted use – potential for acute risk to non-target organisms, but may be mitigated through restricted use classification,
- acute risk, listed species – listed species may be potentially affected by use,
- chronic risk – potential for chronic risk may warrant regulatory action, listed species may potentially be affected through chronic exposure,

Plants:

- non-listed plant risk - potential for effects in non-target (non-endangered) plants, and
- listed plant risk – potential for effects in endangered plants.

Risk, along with the calculation of the corresponding RQs and LOCs, are tabulated below:

Table 45. Agency Levels of Concern (LOC)

Agency Risk Quotient (RQ) Metrics and Levels of Concern (LOC) Per Risk Class.			
Risk Class	**Risk Description**	**RQ**	**LOC**
Aquatic Animals (fish and invertebrates)			
Acute	Potential for effects to non-listed animals from acute exposures	Peak EEC/LC_{50}	0.5
Acute Restricted Use	Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification	Peak EEC/LC_{50}	0.1
Acute Listed Species	Listed species may be potentially affected by acute exposures	Peak EEC/LC_{50}	0.05
Chronic	Potential for effects to non-listed and listed animals from chronic exposures	60-day EEC/NOAEC (fish) 21-day EEC/NOAEC (invertebrates)	1
Aquatic Plants			
Non-Listed	Potential for effects to non-listed plants from exposures	Peak EEC/LC_{50}	1
Listed	Potential for effects to listed plants from exposures	Peak EEC/NOAEC	1

Agency Risk Quotient (RQ) Metrics and Levels of Concern (LOC) Per Risk Class.			
Risk Class	**Risk Description**	**RQ**	**LOC**
Terrestrial Animals (mammals and birds)[2]			
Acute	Potential for effects to non-listed animals from acute exposures	EEC/LC_{50} (Dietary)	0.5
		EEC/LD_{50} (Dose)	
Acute Restricted Use	Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification	EEC/LC_{50} (Dietary)	0.2
		EEC/LD_{50} (Dose)	
Acute Listed Species	Listed species may be potentially affected by acute exposures	EEC/LC_{50} (Dietary)	0.1
		EEC/LD_{50} (Dose)	
Chronic	Potential for effects to non-listed and listed animals from chronic exposures	EEC/NOAEC	1
Bees			
Acute	Potential for effects to terrestrial invertebrates from acute exposures	EEC/LD_{50} (Contact)	0.4
		EEC/LC_{50} (Oral)	
Chronic	Potential for effects to terrestrial invertebrates from chronic exposures	EEC/NOAEC	1
Terrestrial and Semi-Aquatic Plants			
Non-Listed	Potential for effects to non-target, non-listed plants from exposures	EEC/ $_{EC25}$	1
Listed Plant	Potential for effects to non-target, listed plants from exposures	EEC/ NOAEC	1
		EEC/ $_{EC05}$	

For aquatic taxa, acute and chronic risks estimates were based on the maximum aquatic EECs determined for both the rice and in-water aquatic herbicide uses, using the Total Toxic Residue (TTR) EEC values, which included florpyrauxifen-benzyl, XDE-848 acid, XDE-848 hydroxy acid, XDE-848 benzyl hydroxy. For terrestrial taxa, acute and chronic risks estimates were based on the maximum EECs determined for the rice, and foliar uses. These EECs were combined with the most sensitive toxicological endpoint (EEC/MSE) from each taxonomic group, as identified in **Section 4** (Ecological Effects Characterization) to produce RQ values for each taxa (a complete listing of effect endpoints can be found in **Appendix B**).

5.1.1 Risks to Non-Target Aquatic Animals - Uses

5.1.1.1 Freshwater and Estuarine/marine Fish

Acute Risks

The acute risk to freshwater and estuarine/marine fish was estimated by dividing the peak water EEC (parent only) by the 96-hour acute LC_{50} values from the fish studies. Because the acute toxicity endpoints for fish were non-definitive (">") values, the resulting acute RQ values are also non-definitive and range from <0.13 (for the rice use) to <3.1 (for the aquatic, in-water use, maximum rate) for freshwater fish (**Table 46**). Acute RQ values for estuarine/marine fish range from <0.16 (for the rice use) to <3.7 (for the aquatic, in-water use, maximum rate; **Table 47**). The acute toxicity values for fish were non-definitive because these studies were limited by the functional solubility in the test system (~ 40 ppb). Although the acute EECs for aquatic and rice uses (~150 and 6.3 ppb, respectively) exceed or approach the highest concentration tested of the TGAI in acute toxicity tests with fish ~ 40 ppb), multiple lines of evidence suggest a low potential for acute risk to freshwater and estuarine/marine fish. These include:

- Lack of acute toxicity of the TGAI to rainbow trout and sheepshead minnow up to its functional solubility in water (~40 – 60 ppb)
- Low solubility limit of the TGAI (15 ppb)
- Low acute toxicity of the TEPs with carp (LC_{50} > 0.53 ppm to > 3.2 ppm)
- Plant-specific mode of action (auxin mimic)

Chronic Risks

The chronic risk to freshwater fish was estimated by dividing the 60-day average EEC (parent only) by the 33-day NOAEC value of 37.3 µg/L for fathead minnow. The resulting chronic RQ values ranged from 0.01 for the rice use to 0.08 for the aquatic (in-water) use with the maximum application rate. As the RQ values were less than the chronic risk LOC of 1.0, chronic risk to freshwater fish is not indicated for the rice use or the aquatic uses. Importantly, this chronic NOAEC is based on the highest test concentration achievable in the chronic test (37.3 µg/L) and the LOAEC could not be determined due to limits on the functional solubility of florpyrauxifen-benzyl (TGAI) in the test system. Therefore, the potential for chronic risk appears to be constrained by the limit of functional solubility of the TGAI in water (~40 ppb).

No chronic toxicity data were submitted for estuarine/marine fish which represents a data gap in this assessment based on the proposed use pattern of florpyrauxifen-benzyl. The uncertainty associated with this data gap will be discussed in Section 5.2 (Risk Description)

Table 46. Acute and chronic risk quotients for freshwater fish (based on parent only).

Use	Peak EEC (µg a.i./L)	Acute RQ[1]	Water Column 60-day Average EEC (µg a.i./L)	Chronic RQ[2]
AR Rice, winter flood	6.34	<0.13*	0.289	0.01
In-water Aquatic Use (typical rate, 50 ppb)[3]	50 (46.4**)	<1.0*	0.956	0.03
In-water Aquatic Use (maximum rate, 150 ppb)	150 (139**)	<3.1*	2.86	0.08

* Although the acute EECs (~6.34 to 150 ppb) exceed or approach the highest concentration tested of the TGAI in acute toxicity tests with fish (~ 40 ppb), multiple lines of evidence suggest a low potential for acute risk to listed and non-listed freshwater fish (see text for details).

** Value in parenthesis is the modelled EEC. For acute RQ calculation, the nominal concentration was utilized.

1. Acute RQ value based on a LC_{50} value of >49 µg a.i./L. (MRID# 49677735)

2. Chronic RQ value was calculate using a definitive (= 37.3 µg/L) NOAEC, however the LOAEC in this study was not identified (*i.e.,* > 37.3 µg/L. (MRID# 49677747)

3 RQ values based upon the typical application rate (50ppb). Where employed, this rate would reduce risks by 2/3.

Table 47. Acute and chronic risk quotients for estuarine/marine fish (based on parent only).

Use	Peak EEC (µg a.i./L)	Acute RQ[1]	Water Column 60-day Average EEC (µg a.i./L)	Chronic RQ
AR Rice, winter flood	6.34	<0.16*	Not Tested	Not Tested
In-water Aquatic Use (typical rate, at 50 ppb)[2]	50 (46.4**)	<1.2*	Not Tested	Not Tested
In-water Aquatic Use (maximum rate 150 ppb)	150 (139**)	<3.7*	Not Tested	Not Tested

* Although the acute EECs for aquatic and rice uses (~50-150 and 6.34 ppb, respectively) exceed or approach the highest concentration tested of the TGAI in acute toxicity tests with fish (~40 ppb), multiple lines of evidence suggest a low potential for acute risk to listed and non-listed estuarine/marine fish (see text for details).

** Value in parenthesis is the modelled EEC. For acute RQ calculation, the nominal concentration was utilized.

1 Acute RQ value based on a LC_{50} value of >40.3 µg a.i./L. (MRID# 49677737)

2 RQ values based upon the typical application rate (50 ppb). Where employed, this rate would reduce risks by 2/3.

5.1.1.2 Freshwater and Estuarine/Marine Invertebrates (Water Column)

Acute Risks to Freshwater Invertebrates

The acute risk to freshwater invertebrates was estimated by dividing the peak water column EEC (parent only) by the lowest 96-hour acute LC_{50} value among submitted studies for freshwater invertebrates (*Gammarus*, >41.9 µg/L; **Table 48**). Since the acute toxicity value was non-definitive (">"), the resulting acute RQ values are also non-definitive and range from <0.15 (for the rice use) to <3.6 (for the aquatic, in-water use with the maximum rate). The acute toxicity values for freshwater invertebrates were non-definitive because toxicity was limited by the functional solubility in the test system (~ 40 ppb). Although the acute EECs for aquatic and rice uses (~150 and 6.6 ppb, respectively) exceed or approach the highest concentration tested of the TGAI in acute toxicity tests with aquatic invertebrates ~42 ppb), multiple lines of evidence suggest a low potential for acute risk to freshwater invertebrates. These include:

- Lack of acute toxicity of the TGAI to four species of aquatic freshwater aquatic invertebrates up to its functional solubility in test water (~40 ppb)
- Low water solubility of the TGAI (15 ppb)
- Moderate acute toxicity of the TEPs with *D. magna* (LC_{50} of 1.32 mg a.i./L) which is still nearly 10x above the highest EEC of 150 ppb
- Plant-specific mode of action (auxin mimic)

Chronic Risks to Freshwater Invertebrates

The chronic risk to freshwater invertebrates was estimated by dividing the 21-day EEC by the 21-day NOAEC value of 38.5 µg/L for *D. magna*. (**Table 48**). The resulting chronic RQ values range from 0.02 for the rice use to 0.21 for the aquatic (in-water) use. Therefore, chronic risk to freshwater invertebrates inhabiting the water column is not indicated for the rice use or the aquatic in-water use, since the RQ values are less than the chronic risk LOC of 1.0. Importantly, this chronic NOAEC is based on the highest test concentration achievable in the chronic test (38.5 µg/L) and the LOAEC could not be determined due to limits on the functional solubility of florpyrauxifen-benzyl (TGAI) in the test system. Thus, the potential for chronic risk appears to be constrained by the limit of functional solubility of the TGAI in water (~40 ppb).

Table 48. Acute and chronic risk quotients for freshwater (water-column) invertebrates based on parent only

Use	Peak EEC (µg a.i./L)	Acute RQ[1]	Water Column 21-day Avg. EEC (µg a.i./L)	Chronic RQ[2]
AR Rice, winter flood	6.34	<0.15*	0.679	0.02
In-water Aquatic Use (typical rate, 50 ppb)[3]	50 (46.4**)	<1.2*	2.73	0.07
In-water Aquatic Use (maximum rate, 150 ppb)	150 (139**)	<3.6*	8.17	0.21

* Although the acute EECs for aquatic and rice uses (50 to 150 and 6.34 ppb, respectively) exceed or approach the highest concentration tested of the TGAI in acute toxicity tests with freshwater invertebrates (~42 ppb), multiple lines of evidence suggest a low potential for acute risk to freshwater invertebrates (see text for details).

** Value in parenthesis is the modelled EEC. For acute RQ calculation, the nominal concentration was utilized.

[1] Acute RQ value based on a LC_{50} value of >41.9 µg a.i./L. (*Gammarus*, MRID# 49677731)

[2] Chronic RQ value was calculate using a NOAEC of 38.5 µg/L (*Daphnia*, MRID# 49677744), however a LOAEC in this study was not achieved.

[3] RQ values based upon the typical application rate (50 ppb). Where employed, this rate would reduce risks by 2/3.

Acute Risks to Estuarine/Marine Invertebrates

The acute risk to estuarine/marine invertebrates was estimated by dividing the peak water EEC (parent only) by the lowest acute LC_{50} value from estuarine/marine invertebrate studies (>270 µg/L**; Table 49**). The resulting acute RQ values range from <0.02 for the rice use to <0.56 for the aquatic use (in-water, maximum rate). Based on these values, acute risk to estuarine/marine invertebrates inhabiting the water column are not indicated with the rice use. For the aquatic (in-water) use, acute EECs (~50 to 150 ppb) approach the highest concentration tested in the selected acute toxicity test with estuarine/marine invertebrates (270 µg a.i./L with TEP; MRID# 49678010). In this study, no lethal or sublethal effects were reported up to 270 µg a.i./L with TEP, which resulted in an IC_{50} value of >270 µg a.i./L; **Table 37**. Although the acute RQ values (<0.19 to <0.56) can theoretically exceed the listed or non-listed species acute risk LOCs of 0.05 and 0.5, respectively, the acute risk appears to be constrained by the limit of solubility fo the TGAI (15 ppb), since effects were observed at least an order of magnitude above the solubility limit.

Chronic Risks to Estuarine/Marine Invertebrates

The chronic risk to freshwater invertebrates was estimated by dividing the 21-day EEC (parent only) by the 21-day NOAEC value of <1.1 µg a.i./L for mysid shrimp. The resulting acute RQ values range from >0.62 for the rice use to >7.4 for the aquatic (in-water) use (**Table 49**). Although these chronic RQ values are non-definitive (">") values and do not permit the magnitude of LOC exceedance to be determined with precision, they can be used to identify if a chronic LOC is exceeded for some uses. For the aquatic (in-water) use, chronic risk is indicated since the lower bounds of the RQ values exceed the chronic LOC of 1.0. Furthermore, chronic risks are indicated regardless of the assumptions of typical or maximum application rate. For the rice use, the potential for chronic risk cannot be determined with precision nor can it be reasonably precluded because the lower bound of the non-definitive RQ is below the chronic risk LOC of 1.0.

Table 49. Acute and chronic risk quotients for estuarine/marine invertebrates based on parent only

Use	Peak EEC (µg a.i./L)	Acute RQ[1]	Water Column 21-day Avg. EEC (µg a.i./L)	Chronic RQ[2]
AR Rice, winter flood	6.34	<0.02	0.679	>0.62**
In-water Aquatic Use (typical rate, 50 ppb)[3]	50 (46.4***)	<0.19*	2.73	**>2.5**
In-water Aquatic Use (maximum rate, 150 ppb)	150 (139***)	<0.56*	8.17	**>7.4**

RQs with a **bold** font and shaded dark grey exceed the non-listed species LOCs (acute non-listed species LOC = 0.5; chronic non-listed LOC = 1.0).

* Acute EECs for aquatic use (50 to 150 ppb) approach the highest concentration tested in the selected acute toxicity test with estuarine/marine invertebrates (~270 µg a.i./L with TEP) in which no lethal or sublethal effects were

reported (IC_{50} value >270 µg a.i./L; **Table 37**). Although the acute RQ values can theoretically exceed the listed and non-listed acute risk LOCs of 0.05 and 0.5, respectively, the actual potential for acute risks appears constrained by the solubility limit of the TGAI (15 ppb).

** For the rice uses, the potential for exceeding the chronic LOC of 1.0 cannot be determined with precision nor can it be precluded. For the aquatic uses, there are exceedances of the chronic risk LOC of 1.0 and the magnitude (upper limit) of LOC exceedance is not known.

*** Value in parenthesis is the modelled EEC. For acute RQ calculation, the nominal concentration was utilized.

[1] Acute RQ value based on a LC_{50} value of >270 µg a.i./L for eastern oyster (MRID# 49678010)

[2] Chronic RQ value based upon an unbounded NOAEC value of <1.1µg/L for mysid shrimp (MRID# 49677746)

[3] RQ values based upon the typical application rate (50 ppb). Where employed, these rates would reduce risks by 2/3.

5.1.1.3 Benthic Invertebrates

Acute and Chronic Risks to Freshwater Benthic Invertebrates

In the absence of acute toxicity data for benthic organisms, the equilibrium partitioning (EqP) approach was used to assess the freshwater benthic invertebrates partitioning (Di Toro, 1991). The EqP approach relies on the lowest water column toxicity test and the pore water EECs. It is assumed that the benthic organisms show similar sensitivity towards a given stressor than the corresponding water column invertebrates. The acute risk to benthic freshwater organisms was estimated by dividing the peak pore water EEC (parent only) by the lowest water column freshwater invertebrate toxicity endpoint (LC_{50} value of >41.9 µg a.i./L for *Gammarus*, MRID# 49677731). Althgouth the acute RQ values for benthic freshwater invertebrates were non-definitive ("<") values, they all fell below the non-listed and listed species acute risk LOCs of 0.5 and 0.05, respectively (**Table 50**).

The chronic risk to freshwater benthic invertebrates was estimated by dividing the 21-day, parent only EECs in pore water and sediment by the lowest available chronic or subchronic NOAEC value (<4.32 µg a.i./L-pore water and <5,250 µg a.i./kg-sediment) from the freshwater midge sediment toxicity study (MRID #49677750; **Table 50**). The resulting pore water RQs range from >0.01 for the rice use to >0.14 for the aquatic use (in-water, maximum rate). These chronic RQ values are non-definitive (">") values because treatment-related effects were observed in all test concentrations of the midge sediment toxicity study, resulting in a NOAEC of < 4.32 µg a.i./L-pore water. For the rice and aquatic uses, the potential for chronic risk cannot be determined with precision nor can it be reasonably precluded.

Acute and Chronic Risks to Estuarine/Marine Benthic Invertebrates

In the absence of sediment toxicity data, the equilibrium partitioning approach (EqP) was used to assess the estuarine/marine benthic invertebrates. The acute RQ value was based on the peak pore water EEC divided by the lowest water column LC_{50} value of >270 µg a.i./L for eastern oyster (MRID# 49678010). The resulting acute RQ values are non-definitive ("<") less than values.

Similarly, the chronic RQ value was based upon the 21-day pore water EEC (parent only) divided by the water column unbounded NOAEC value of <1.1µg/L for mysid shrimp (MRID# 49677746). The chronic RQ values are non-definitive (">") values because treatment-related effects were observed in all test concentrations of the mysid shrimp water column toxicity study. For the rice and aquatic uses, the potential for chronic risk cannot be determined with precision nor can it be reasonably precluded.

Table 50. Acute and chronic risk quotients for freshwater benthic invertebrates based on parent only

Use	Pore-Water Acute EEC (µg a.i./L)	Acute pore water RQ[1]	Pore-Water 21-day Avg. EEC (µg a.i./L)	Chronic pore water RQ[2]	Sediment 21-day Avg. EEC (µg a.i./kg)	Chronic sediment RQ[2]
AR Rice, winter flood	0.181	<0.01	0.149	>0.03*	48.1	>0.01*
In-water Aquatic Use (typical rate, 50 ppb)[3]	0.577	<0.01	0.191	>0.04*	246	>0.05*
In-water Aquatic Use (maximum rate, 150 ppb)	1.72	<0.04	0.570	>0.13*	735	>0.14*

* The potential for exceeding the chronic LOC of 1.0 cannot be determined with accuracy, nor can it be precluded.

[1] Acute RQ value based on a water column LC_{50} value of >41.9 µg a.i./L. (*Gammarus*, MRID# 49677731)

[2] Chronic RQ values were calculate using unbounded pore-water (<4.32 µg a.i./L) and sediment (<5,250 µg a.i./kg-sediment) NOAECs. (MRID# 49677750)

[3] RQ values based upon the typical application rate (50 ppb). Where employed, these rates would reduce risks by 2/3.

Table 51. Acute and chronic risk quotients for estuarine/marine benthic invertebrates based on parent only[4]

Use	Pore-Water Acute EEC (µg a.i./L)	Acute pore water RQ[1]	Pore-Water 21-day Avg. EEC (µg a.i./L)	Chronic pore water RQ[2]
AR Rice, winter flood	0.181	<0.01	0.149	>0.14*
In-water Aquatic Use (typical rate, at 50 ppb)[3]	0.577	<0.01	0.191	>0.17*
In-water Aquatic Use (maximum rate 150 ppb)	1.72	<0.01	0.570	>0.52*

* The potential for exceeding the chronic LOC of 1.0 cannot be determined with accuracy, nor can it be precluded.

[1] Acute RQ value based on a water column LC_{50} value of >270 µg a.i./L for eastern oyster (MRID# 49678010)

[2] Chronic RQ value based upon an unbounded water column NOAEC value of <1.1µg/L for mysid shrimp (MRID# 49677746)

[3] RQ values based upon the typical application rate (50 ppb). Where employed, these rates would reduce risks by 2/3.

[4] Chronic sediment EEC and RQ values are not available because an estuarine/marine benthic invertebrate study was not submitted.

5.1.2 Risks to Non-Target Aquatic Plants (vascular & non-vascular)

As expected from an auxin based herbicide, the RQ values for vascular aquatic plants are greater than RQ values for non-vascular plants. Uncertainties related to aquatic plant risk assessment are described in **Section 5.2**, below.

The acute risk to non-vascular aquatic plants was estimated by dividing the peak water EEC (TTR) by the 96-hour acute IC_{50} values from the algae/diatom studies (**Table 52)** to produce RQs for *non-listed* aquatic plants. Similarly, peak EEC values for the TTR were compared to the most sensitive NOAEC values to produce RQs for *listed* aquatic plants. As described in the Problem Formulation (Section 3.3), the TTR method is used to determine EECs which reflects the parent, XDE-848 acid, XDE-848 hydroxy acid, and XDE-848 benzyl hydroxyl components because each of these compounds exhibited phytotoxicity to aquatic plants at environmentally relevant levels. Because the expected portioning of these compounds differ widely, the EECs were modeled using the parent only Koc and the acid Koc in effort to bound the potential risk to aquatic plants. The resulting RQ values for non-vascular plants ranged from <0.17 for the rice use (non-listed) to 12 for the aquatic (in-water) use (listed species). For the rice use, risk to non-vascular listed and non-listed aquatic plants is not indicated. For the aquatic (in-water) use, risk to listed non-vascular plants is indicated (RQ = 12 vs. LOC = 1) regardless of the partitioning assumptions made or whether typical or maximum application rates are assumed. Risks to non-listed, non-vascular plants are uncertain for the aquatic (in-water) use because the non-definitive ("<") RQ values are based on a non-definitive (">") IC_{50} value.

Table 52. Acute and chronic risk quotients for non-target non-vascular aquatic plants based on total toxic residues

Use	Peak EEC (µg a.i./L)	Listed Species RQ[1]	Non-Listed Species RQ[2]
AR Rice, winter flood (TTR using Parent K_{oc})	6.61	0.53	<0.17
Aquatic in-water (typical rate, at 50 ppb)[3]	50	**4.0**	<1.3*
Aquatic in-water maximum rate (TTRs assuming parent's K_{oc})	150	**12**	<3.9*
Aquatic, in-water (TTRs assuming XDE-848 acid's K_{oc})	147	**12**	<3.8*

Shaded and bold RQ values indicate exceedance of the chronic risk LOC of 1.0

* EECs for aquatic use (50 & 150 ppb) exceed the highest concentration tested in the non-vascular plant toxicity study (IC_{50} value >38.9 µg a.i./L). Although the RQ values can theoretically exceed the non-listed aquatic plant LOC of 1.0, the actual potential for risks to non-vascular plants cannot be determined with precision.

[1] Listed species based upon a NOAEC value of 12.4 µg a.i./L for the marine diatom (MRID# 49677766).
[2] Non-Listed RQ value was calculate using a IC_{50} value of >38.9µg/L for the marine diatom (MRID# 49677766).
[3] RQ values based upon the typical application rate (50 ppb). Where employed, they would reduce risks by 2/3.

The acute risk to vascular aquatic plants was estimated by dividing the peak water EEC (TTR) by the lowest 14-day EC_{50} values from the submitted submerged aquatic vegetation (SAV) and *Lemna* studies (**Table 53)** to produce the *non-listed* aquatic plant RQs. Similarly, peak EEC values were compared against the most sensitive NOAEC value to produce *listed* aquatic plant RQs. The resulting range of RQ values was from 410 for rice uses (non-listed species) to 31,300 for the aquatic (in-water) use (listed species). Based on these values both the rice and aquatic (in-water) uses are expected to result in risk to aquatic vascular plants. Exceedances are expected given that submerged aquatic plants are among the target species for this herbicide.

Table 53. Acute and chronic risk quotients for non-target vascular aquatic plants based on total toxic residues.

Use	Peak EEC (µg a.i./L)	Listed Species RQ[1]	Non-Listed Species RQ[2]
AR Rice, winter flood (TTR using Parent K_{oc})	6.61	**1,400**	**410**
Aquatic in-water (typical rate, at 50 ppb)[3]	50	**10,400**	**3,090**
Aquatic, in-water (TTRs assuming parent's K_{oc})	150	**31,300**	**9,260**
Aquatic, in-water (TTRs assuming XDE-848 acid's K_{oc})	147	**30,600**	**9,070**

Shaded and bold RQ values indicate exceedance of the chronic risk LOC of 1.0
[1] Listed species based upon a NOAEC value of 0.0048 µg a.i./L. (MRID# 49677805)
[2] Non-Listed RQ value was calculate using a IC_{50} value of 0.0162 µg/L. (MRID# 49677805)
[3] RQ values based upon the typical application rate (50ppb). Where employed, they would reduce risks by 2/3.

5.1.3 Risks to Non-Target Terrestrial Animals

Risk to non-target, terrestrial animals is based on the maximum proposed rate for rice (0.0268 lb a.i./A) and for aquatic-foliar spray applications (0.0527 lb a.i./A). Uncertainties related to terrestrial animal risk assessment are described in **Section 5.2**, below.

5.1.3.1 Birds

Acute and Sub-Acute Risks

Acute risk to birds is estimated by dividing the dose or diet-based EEC by the corresponding dose or diet-based acute toxicity endpoint (LD_{50}, LC_{50}). For the rice and aquatic-foliar uses, acute dose-based RQ values are based on the lowest LD_{50} values adjusted for differences in body weight (20, 100, 1000g) and were modeled via T-REX for various use and dietary categories. Similarly, acute dietary-based RQ values were calculated by dividing the dietary EEC (specific to each food category) by the most sensitive diet-based LC_{50} value available for birds. Unlike dose-based RQs, the dietary-based RQ values are not specific to the body weight of birds.

Avian dose-based acute RQs were based on the Northern Bobwhite oral toxicity endpoint, which was the most sensitive acute LD_{50} for birds (LD_{50} >2,250 mg a.i./kg bw. / MRID #49677751). Similarly, sub-acute dietary based RQs were based on the Mallard oral toxicity endpoint (LC_{50} >5,640 mg a.i./kg-diet / MRID #49677754).

Tables 54 and 55 show the acute dose-based and sub-acute dietary-based RQ values for birds. Because all of the acute endpoints from these toxicity studies were non-definitive 'greater than' values, the resulting RQs are expressed as non-definitive 'less-than' values. The acute oral and dietary RQ values are <0.01 to <0.02 for all dietary items and size classes of birds which are below the listed and non-listed acute risk LOC of 0.1 and 0.5, respectively. Consequently, although the exact acute RQ values are not known, it is clear that all are below the acute risk LOCs. Therefore, acute risk to birds on a dose or dietary basis is not indicated for the proposed rice and aquatic-foliar uses of florpyrauxifen-benzyl.

Table 54. Acute dose-based risk quotients for birds resulting from Rice and Aquatic-Foliar uses[1]

Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients													
Size Class (grams)	Adjusted LD_{50}	EECs and RQs											
		Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
Rice Use													
20	1168	12.88	<.01	5.90	<.01	7.24	<.01	0.80	<.01	5.04	<.01	0.18	<.01
100	1487	7.34	<.01	3.37	<.01	4.13	<.01	0.46	<.01	2.88	<.01	0.10	<.01
1000	2101	3.29	<.01	1.51	<.01	1.85	<.01	0.21	<.01	1.29	<.01	0.05	<.01
Aquatic-Foliar Use													
20	1621	25.32	<.02	11.6	<.01	14.2	<.01	1.58	<.01	9.92	<.01	0.35	<.01
100	2064	14.44	<.01	6.62	<.01	8.12	<.01	0.90	<.01	5.66	<.01	0.20	<.01
1000	2915	6.46	<.01	2.96	<.01	3.64	<.01	0.40	<.01	2.53	<.01	0.09	<.01

[1] EEC and RQ values provided by T-REX (V5.2.2).

Table 55. Sub-acute dietary-based risk quotients for birds resulting from Rice and Aquatic-Foliar uses[1]

Upper Bound Kenaga, Sub-Acute Avian Dietary-Based Risk Quotients												
LC_{50}	EECs and RQs											
	Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
Rice Use												
5640	11.31	<.01	5.18	<.01	6.36	<.01	0.71	<.01	4.43	<.01	NA	NA
Aquatic-Foliar Use												

Upper Bound Kenaga, Sub-Acute Avian Dietary-Based Risk Quotients												
LC_{50}	EECs and RQs											
	Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
5640	22.23	<.01	10.19	<.01	12.51	<.01	1.39	<.01	8.71	<.01	NA	NA

[1] EEC and RQ values provided by T-REX (V5.2.2).

Chronic Risks

Chronic risk to birds was estimated by dividing the dietary-based EEC by the corresponding chronic toxicity endpoint (NOAEC), which was also expressed on a dietary basis. The lowest available chronic NOAEC value for birds was a NOAEC of 398 mg a.i./kg-diet for bobwhite quail (MRID #49677751; LOAEC = 999 mg a.i./kg-diet). Given the relatively low application rates and low chronic toxicity of florpyrauxifen-benzyl to birds, chronic RQ values ranged from 0.02 to 0.06 among the two uses and dietary categories, which were below the chronic LOC of 1. **(Tables 56 and 57)**. Therefore, chronic risk to birds is not indicated for the proposed rice and aquatic-foliar uses.

Table 56. Chronic dose-based risk quotients for birds resulting from Rice and Aquatic-Foliar uses[1]

Upper Bound Kenaga, Chronic Avian Dietary-Based Risk Quotients												
NOAEC	EECs and RQs											
	Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
Rice Use												
398	11.31	0.03	5.18	0.01	6.36	0.02	0.71	0.00	4.43	0.01	NA	NA
Aquatic-Foliar Use												
398	22.23	0.06	10.19	0.03	12.51	0.03	1.39	0.00	8.71	0.02	NA	NA

1 EEC and RQ values provided by T-REX (V5.2.2).

Risks to Birds from Bioaccumulation in the Aquatic Food Web

Results from the KABAM modeling for piscivorous birds consuming aquatic organisms contaminated with florpyrauxifen-benzyl are shown in **Table 55** for the aquatic-foliar and rice uses. The KABAM model default metabolism rate constant was adjusted to reflect that calculated for the submitted fish BCF study as described in Section 3. It is important to note that the acute toxicity data used to determine the avian RQ values are all non-definitive (“>”) LD_{50} values. Therefore, the highest treatment tested was selected as the toxicity value for screening assessment purposes. Even with this conservative assumption regarding the toxicity value, all acute and chronic RQ values are below the Agency’s LOCs for both uses, thus indicating a low potential for risks to piscivorous birds.

Table 57. Calculation of RQ values for birds consuming fish and aquatic invertebrates contaminated by florpyrauxifen-benzyl

Wildlife Species	Acute [1]		Chronic [2]	
	Dose Based	Dietary Based	Dose Based	Dietary Based
Aquatic-In-water Use (Maximum Rate)				
sandpipers	0.04	0.011	N/A	0.15
cranes	0.002	0.011	N/A	0.15
rails	0.02	0.010	N/A	0.14
herons	<0.01	0.010	N/A	0.14
small osprey	<0.01	<0.01	N/A	<0.01
white pelican	<0.01	<0.01	N/A	<0.01
Aquatic-In-water Use (Typical Rate)				
sandpipers	0.013	<0.01	N/A	0.05
cranes	<0.01	<0.01	N/A	0.05
rails	<0.01	<0.01	N/A	0.05
herons	<0.01	<0.01	N/A	0.05
small osprey	<0.01	<0.01	N/A	<0.01
white pelican	<0.01	<0.01	N/A	<0.01
Rice Use				
sandpipers	<0.01	<0.01	N/A	0.01
cranes	<0.01	<0.01	N/A	0.01
rails	<0.01	<0.01	N/A	0.01
herons	<0.01	<0.01	N/A	0.01
small osprey	<0.01	<0.01	N/A	<0.01
white pelican	<0.01	<0.01	N/A	<0.01

[1] Acute RQ based on northern bobwhite LD_{50} (>2,250 mg a.i./kg bw, MRID #49677751) and LC_{50} (>5,640 mg a.i./kg-diet, MRID #49677754) and 21-d EECs (parent only) as described in **Table 33**.
2 Chronic RQ based on NOAEC of 398 mg/kg-diet for bobwhite quail (MRID #49677751) and 21-d EECs (parent only) as described in **Table 33.**

5.1.3.2 Mammals

Acute Risks

Acute mammalian RQ values were calculated by dividing the dose-based EECs by the lowest available dose-based acute LD_{50} value (> 5,000 mg a.i./kg-bw; MRID 49677703). The acute dose-based RQ values were based on LD_{50} values adjusted (by T-REX) for differences in body weight for a small (15g), medium (35g) and large (1000g) mammal (adjusted LD_{50} = >10989, >8891, and >3846 mg/kg-bw, respectively) and were modeled for various use and diet categories.

Table 58 shows the acute dose based risk for mammals. Because lowest available acute endpoint is a non-definitive 'greater than' value, the resulting acute RQs are also expressed as non-definitive 'less-than' values. All acute RQ values were <0.01 for both the rice and aquatic-foliar uses, which are below the listed and non-listed acute risk LOC of 0.1 and 0.5, respectively. Consequently, although the exact acute RQ values are not known, it is clear that all are below the acute risk LOCs. Therefore, acute risk to mammals on a dose basis is not indicated for the proposed rice and aquatic-foliar uses of florpyrauxifen-benzyl.

Table 58. Acute dose-based risk quotients for mammals resulting from Rice and Aquatic-Foliar uses[1]

Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients													
Size Class (grams)	Adjusted LD_{50}	EECs and RQs											
		Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
Rice Use													
15	10989	10.78	<.01	4.94	<.01	6.06	<.01	0.67	<.01	4.22	<.01	0.15	<.01
35	8891	7.45	<.01	3.41	<.01	4.19	<.01	0.47	<.01	2.92	<.01	0.10	<.01
1000	3845	1.73	<.01	0.79	<.01	0.97	<.01	0.11	<.01	0.68	<.01	0.02	<.01
Foliar Use													
15	10989	21.20	<.01	9.72	<.01	11.9	<.01	1.32	<.01	8.30	<.01	0.29	<.01
35	8891	14.65	<.01	6.71	<.01	8.24	<.01	0.92	<.01	5.74	<.01	0.20	<.01
1000	3845	3.40	<.01	1.56	<.01	1.91	<.01	0.21	<.01	1.33	<.01	0.05	<.01

[1] EEC and RQ values provided by T-REX (V5.2.2).

Chronic Toxicity Risks

Chronic risk to mammals was estimated by dividing the dose or dietary-based EEC (specific for different dietary categories) by the corresponding dose or dietary-based chronic toxicity endpoint (NOAEL or NOAEC). Chronic mammalian RQ values were calculated using a dose-based chronic NOAEL >300 mg/kg-bw/day and a dietary-based chronic NOAEC of 6,000 mg a.i./kg-diet derived from the rat 2-generation, oral reproduction study (MRID #49677855). Importantly, these chronic NOAEL and NOAEC values reflect the highest dose or concentration tested in the study (*i.e.,* LOAEL/LOAEC were not achieved due to the low toxicity of the chemical) and thus are considered "unbounded" by the corresponding LOAEL / LOAEC endpoints.

Tables 59 thru 60 show the dose-based and dietary-based chronic risk for mammals. Because all of the endpoints from the mammalian toxicity studies were non-definitive 'greater than' values, the resulting RQs are expressed as non-definitive 'less-than' values. Dose-based chronic RQ values ranged from <0.01 to < 0.02 for the rice use and from <0.01 to < 0.03 for the aquatic-foliar use. Since these chronic RQ values are below the chronic risk LOC of 1.0, chronic risk to mammals is not indicated from the proposed uses of florpyrauxifen-benzyl.

Table 59. Chronic dose-based risk quotients for mammals resulting from Rice and Aquatic-Foliar uses[1]

Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients													
Size Class (grams)	Adjusted LD50	EECs and RQs											
		Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
Rice Use													
15	659	10.78	<.02	4.94	<.01	6.06	<.01	0.67	<.01	4.22	<.01	0.15	<.01
35	533	7.45	<.01	3.41	<.01	4.19	<.01	0.47	<.01	2.92	<.01	0.10	<.01
1000	231	1.73	<.01	0.79	<.01	0.97	<.01	0.11	<.01	0.68	<.01	0.02	<.01
Aquatic-Foliar Use													

Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients													
Size Class (grams)	Adjusted LD50	EECs and RQs											
		Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	659	21.20	<.03	9.72	<.01	11.9	<.02	1.32	<.01	8.30	<.01	0.29	<.01
35	533	14.65	<.03	6.71	<.01	8.24	0.02	0.92	<.01	5.74	<.01	0.20	<.01
1000	231	3.40	<.01	1.56	<.01	1.91	<.01	0.21	<.01	1.33	<.01	0.05	<.01

[1] EEC and RQ values provided by T-REX (V5.2.2).

Table 60. Foliar Use - Chronic dietary-based risk quotients for mammals resulting from Rice and Aquatic-Foliar uses[1]

Upper Bound Kenaga, Chronic Mammalian Dietary-Based Risk Quotients												
NOAEC	EECs and RQs											
	Short Grass		Tall Grass		Broadleaf Plants		Fruits/ Pods/Seeds		Arthropods		Granivore	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
Rice Use												
6000	11.3	<.01	5.18	<.01	6.36	<.01	0.71	<.01	4.43	<.01	NA	NA
Aquatic-Foliar Use												
6000	22.2	<.01	10.19	<.01	12.51	<.01	1.39	<.01	8.71	<.01	NA	NA

1 EEC and RQ values provided by T-REX (V5.2.2).

Risks to Mammals from Bioaccumulation in the Aquatic Food Web

Results from the KABAM modeling for piscivorous mammals consuming aquatic organisms contaminated with florpyrauxifen-benzyl are shown in **Table 61** for the aquatic-foliar and rice uses. It is important to note that the acute toxicity data used to determine the acute mammalian RQ values are non-definitive (">") values. Therefore, the highest treatment tested was selected as the toxicity value for screening assessment purposes. Even with this conservative assumption regarding the toxicity value, all acute RQ values are below the Agency's LOCs for both uses, thus indicating a low potential for acute risk to piscivorous mammals for all uses assessed. For chronic risks to piscivorous mammals, RQ values for the aquatic use (typical rate) and rice use are below the chronic risk LOC of 1.0. For the aquatic use based on the maximum allowable rate, chronic RQ values for two smaller mammals exceed the chronic risk LOC by a factor of 2 or less. These RQ values are considered uncertain because: 1) they are based on a chronic mammalian NOAEL which was not bounded by a LOAEL, and 2) it was assumed that aquatic invertebrates did not metabolize florpyrauxifen-benzyl due to the lack of information to determine metabolic rate constants for aquatic invertebrates.

Table 61. Calculation of RQ values for mammals consuming fish and aquatic invertebrates contaminated by florpyrauxifen-benzyl

Wildlife Species	Acute		Chronic	
	Dose Based	Dietary Based	Dose Based	Dietary Based
Aquatic In-water Use (Maximum Rate)				
fog/water shrew	<0.01	N/A	**2.0***	0.36

Wildlife Species	Acute		Chronic	
	Dose Based	Dietary Based	Dose Based	Dietary Based
rice rat/star-nosed mole	<0.01	N/A	**1.4***	0.21
small mink	<0.01	N/A	0.056	<0.01
large mink	<0.01	N/A	0.062	<0.01
small river otter	<0.01	N/A	0.066	<0.01
large river otter	<0.01	N/A	0.020	<0.01
Aquatic In-water Use (Typical Rate)				
fog/water shrew	<0.01	N/A	0.672	0.121
rice rat/star-nosed mole	<0.01	N/A	0.471	0.069
small mink	<0.01	N/A	0.019	<0.01
large mink	<0.01	N/A	0.021	<0.01
small river otter	<0.01	N/A	0.022	<0.01
large river otter	<0.01	N/A	<0.01	<0.01
Rice Use				
fog/water shrew	<0.01	N/A	0.169	0.030
rice rat/star-nosed mole	<0.01	N/A	0.118	0.017
small mink	<0.01	N/A	<0.01	<0.01
large mink	<0.01	N/A	<0.01	<0.01
small river otter	<0.01	N/A	<0.01	<0.01
large river otter	<0.01	N/A	<0.01	<0.01

Shaded and bolded RQ values indicate exceedance of the chronic risk LOC of 1.0
*These RQs are based on an unbounded NOAEC and assume no metabolism of florpyrauxifen-benzyl by aquatic invertebrates
[1] Acute RQ values for mammals calculated using an LD_{50} value of > 5,000 mg a.i./kg-bw (MRID 49677703
[2] Chronic dose-based and dietary-based RQ values for mammals calculated using a chronic NOAEL of >300 mg/kg-bw/day and a dietary-based chronic NOAEC of 6,000 mg a.i./kg-diet (MRID #49677855)

5.1.3.3 Risks to Bees

BeeRex V1.0 was used to calculate the RQs for the aquatic-foliar use using both oral and contact toxicity endpoint values, by dividing the EEC by the corresponding acute toxicity endpoint (LD_{50}) value. The rice use was not evaluated since rice is considered non-attractive to bees[22]. For the aquatic foliar use, it was assumed that emergent aquatic vegetation could be in bloom and attractive to bees during application. Since the caste/task possessing the highest RQ (adult worker – foraging for nectar) is protective of the other caste/task categories, only that data is presented. Honey bee dose-based acute RQs were based on the honey bee contact (LD_{50} >100 µg/bee / #46977757) and oral (LD_{50} >105 µg/bee / #46977757) toxicity endpoint values.

Table 62 shows the acute risk for bees. Because all of the endpoints from the acute bee toxicity studies were non-definitive 'greater than' values, the resulting RQs are expressed as non-definitive 'less-than' values. RQ values were < 0.02 for the aquatic-foliar use, and the acute LOC values for bees is 0.4. Consequently, acute risk to adult bees are not indicated based on the proposed aquatic-foliar use of florpyrauxifen-benzyl. Data on the chronic toxicity of florpyrauxifen-benzyl was not

[22] https://www.ree.usda.gov/ree/news/Attractiveness_of_Agriculture_crops_to_pollinating_bees_Report-FINAL.pdf

submitted to the Agency, and therefore, chronic risks to bees could not be estimated. The uncertainty associated with the lack of chronic toxicity data for bees with florpyrauxifen-benzyl is discussed in **Section 5.2** (Risk Description).

Table 62. Acute dose-based risk quotients for bees resulting from Rice and Aquatic-Foliar uses[1]

Caste / Task	Material / Use	Species	Endpoint / MRID#	EEC	RQ
Foliar Use					
Adult Worker / foraging for nectar	Aquatics (foliar use) / GF-3301	Honey Bee (*Apis mellifera*)	Contact: LD_{50} >100 µg/bee (#46977757)	5.8 mg a.i/kg[1]	< 0.02[1]
Adult Worker / foraging for nectar	Aquatics (foliar use) / GF-3301	Honey Bee (*Apis mellifera*)	Oral: LC_{50} >105 µg/bee (#46977757)	5.8 mg a.i/kg[1]	< 0.02[1]

[1] EEC and RQ values provided by BeeRex v1.0

5.1.4. Risks Terrestrial Plants

Risks of the proposed uses of florpyrauxifen-benzyl to terrestrial plants were estimated using the TerrPlant model (v 1.2.2) which considers exposure via spray drift and runoff to plants inhabiting a field adjacent to the application site. For the proposed rice use, both aerial spray drift and runoff to adjacent sites were modeled. For the proposed aquatic-foliar use, only aerial spray drift was modeled since runoff from applications to a waterbody to an adjacent field is not considered realistic. For a similar reason, risk from the aquatic (in-water) application to terrestrial plants was also not considered realistic. Risk estimates for florpyrauxifen-benzyl are presented separately for the most sensitive monocot (**Table 63**) and dicot species (**Table 64**), as well as for listed and non-listed plant species. Risk estimates are also provided for the primary degradation product, XDE-848 acid (**Tables 65 and 66**). Within each RQ table below, risks to listed terrestrial plants is based on the NOAEC whereas those for non-listed terrestrial plants are based on EC_{25}values.

For the rice use, risk to terrestrial plants from the parent compound is indicated for both monocots (RQ range = 0.26 to 1.2, **Table 63**) and dicots (RQ range = 0.63 to 96, **Table 64**). Similarly, for the aquatic-foliar use, the risk of the parent compound to terrestrial plants is indicated for both monocots (RQ range = 0.63 to 0.78, **Table 63**) and for dicots (RQ range = 56 to 188, **Table 64**).

Since transformation to the acid degradate is relevant, risks to terrestrial plants were also modeled assuming immediate conversion to the acid degradate. For the rice use, risks from the acid degradate are indicated for both monocots (RQ range = <0.1 to 53, **Table 65**) and dicots (RQ range = 2.3 to 474, **Table 66**). For the aquatic-foliar use, risks of the acid degradate to terrestrial plants is indicated for monocots (RQ range = 1.6 to 9.5, **Table 65**) and for dicots (RQ range = 5.4 to 9.5, **Table 66**). Therefore, in terms of exceeding the terrestrial plant LOC, similar risk conclusions are reached when modeling both the parent compound (florpyrauxifen-benzyl) and acid degradate: a.)

the foliar use RQ values exceed the analogous rice use RQ values, and b.) dicot RQ values exceed the analogous monocot RQ values.

Finally, based on spray-drift analysis (AgDRIFT, v.2.1.1), several crops would experience effects beyond the 2,600 feet from the point of application (the limit of AgDRIFT modeling). See Section 5.2.4 for additional details.

Table 63. RQs for non-target terrestrial *Monocots* exposed to florpyrauxifen-benzyl

Use	Single Max. Application Rate (lbs a.i./A)	Monocot RQ Values					
		Spray Drift Only		Runoff and Spray Drift (Dry Areas)		Runoff and Spray Drift (Semi-Aquatic Areas)	
		Non-listed Species	Listed Species	Non-listed Species	Listed Species	Non-listed Species	Listed Species
Rice	0.0268	0.32	0.39	0.26	0.47	0.65	**1.2**
Aquatic Foliar[2]	0.0527	0.63	0.78	n.a.	n.a.	n.a.	n.a.

[1]**Bolded and shaded** values exceed LOC (both listed and non-listed species of 1.0)
[2] Transport to adjacent terrestrial areas via runoff and combined runoff/spray drift are not considered applicable to aquatic uses.

TerrPlant (v.1.2.2) ***input values*** *for florpyrauxifen-benzyl based on the rice use (lb/A).*

	Seedling Emergence		Vegetative Vigor	
Plant type	EC_{25}	NOAEC	EC_{25}	NOAEC
Monocot	0.00617	0.0034	0.00415	0.0034

Table 64. RQs for non-target terrestrial *Dicots* exposed to florpyrauxifen-benzyl

Use	Single Max. Application Rate (lbs a.i./A)	Dicot RQ Values					
		Spray Drift Only		Runoff and Spray Drift (Dry Areas)		Runoff and Spray Drift (Semi-Aquatic Areas)	
		Non-listed Species	Listed Species	Non-listed Species	Listed Species	Non-listed Species	Listed Species
Rice	0.0268	**29**	**96**	0.63	**6.1**	**1.6**	**15**
Aquatic Foliar[2]	0.0527	**56**	**188**	n.a.	n.a.	n.a.	n.a.

[1] **Bolded and shaded** values exceed LOC (both listed and non-listed species of 1.0)
[2] Transport to adjacent terrestrial areas via runoff and combined runoff/spray drift are not considered applicable to aquatic uses.

TerrPlant (v.1.2.2) ***input values*** *for florpyrauxifen-benzyl based on the rice use (lb/A).*

	Seedling Emergence		Vegetative Vigor	
Plant type	EC_{25}	NOAEC	EC_{25}	NOAEC
Dicot	0.00254	0.0013	0.0000469	0.000014

Table 65. RQs for non-target terrestrial *Monocots* exposed to XDE-848 acid

Use	Single Max. Application Rate (lbs a.i./A)	Monocot RQ Values					
		Spray Drift Only		Runoff and Spray Drift (Dry Areas)		Runoff and Spray Drift (Semi-Aquatic Areas)	
		Non-listed Species	Listed Species	Non-listed Species	Listed Species	Non-listed Species	Listed Species
Rice	0.0268	<0.1	**4.8**	0.16	**9.6**	0.91	**53**
Aquatic Foliar[2]	0.0527	0.16	**9.5**	n.a.	n.a.	n.a.	n.a.

[1]**Bolded and shaded** values exceed LOC (both listed and non-listed species of 1.0)
[2] Transport to adjacent terrestrial areas via runoff and combined runoff/spray drift are not considered applicable to aquatic uses.

TerrPlant (v.1.2.2) input values for XDE-848 acid based on the rice use (lb/A).

	Seedling Emergence		Vegetative Vigor	
Plant type	EC_{25}	NOAEC	EC_{25}	NOAEC
Monocot	0.0129	0.000221*	0.0364	0.023

* Based on IC_{05} because the NOAEC value was a greater than (>) non-definitive value.

Table 66. RQs for non-target terrestrial *Dicots* exposed to XDE-848 acid

Use	Single Max. Application Rate (lbs a.i./A)	Dicot RQ Values					
		Spray Drift Only		Runoff and Spray Drift (Dry Areas)		Runoff and Spray Drift (Semi-Aquatic Areas)	
		Non-listed Species	Listed Species	Non-listed Species	Listed Species	Non-listed Species	Listed Species
Rice	0.0268	**2.7**	**4.8**	**2.3**	**86**	**12.6**	**474**
Foliar[2]	0.0527	**5.4**	**9.5**	n.a.	n.a.	n.a.	n.a.

[1]**Bolded and shaded** values exceed LOC (both listed and non-listed species of 1.0)
[2] Transport to adjacent terrestrial areas via runoff and combined runoff/spray drift are not considered applicable to aquatic uses.

TerrPlant (v.1.2.2) input values for XDE-848 acid based on the rice use (lb/A).

	Seedling Emergence		Vegetative Vigor	
Plant type	EC_{25}	NOAEC	EC_{25}	NOAEC
Dicot	0.000931	0.00054	0.000389	0.00022

Use of contaminated water via irrigation

Because florpyrauxifen-benzyl TTRs are persistent and mobile (assuming the hydrophilicity and mobility of the acid), surface water used for irrigation purposes is a potential route of exposure for terrestrial and semi-aquatic plants. That notwithstanding, the proposed GF-3301 label makes three recommendations for the use of contaminated water:

1. The use of treated water for irrigation of established turf is permitted without dilution or a waiting period.
2. The use of contaminated irrigation water on food/feed crops is limited to on-site (rice field) locations for concentrations higher than 1 ppb unless a 30-day pre-harvest interval can be observed. If the water is going to be applied to crops other than rice, the concentration should be less than 1 ppb or authorization should be obtained from Dow AgroSciences.
3. A table of waiting periods for use of contaminated water on "*potentially sensitive vegetation*" is provided, and the number of "*Days of Irrigation Precaution*" ranges from 3 to 28 days.

In the field, the main degradate observed was XDE-848 acid. Meanwhile, the water half-lives of the parent compound were 1.4 and 2.3 days in FL and NC, respectively, when applications occurred at 50 ppb, and 6.4 days in FL, when applied at 150 ppb. In the laboratory studies, the florpyrauxifen-benzyl TTRs are persistent under hydrolytic, as well as under aerobic and anaerobic aquatic conditions. In order to determine whether the irrigation on crops constitutes a threat to non-target plants, a series of calculations were performed as follows:
To calculate the equivalent application rate of one inch of irrigation water with a concentration of 1 ppb = 0.001 mg/L of florpyrauxifen-benzyl in lb a.i./A, **Eqn. 1** is used:

Equation 1.
EEC lb a.i./Acre = (0.001 mg/L) * (102,790 L water/Acre-in) * (1 inch) * (1 lb/453,592 mg)

EEC lb a.i./Acre = **0.000227 lb a.i./A**

The most sensitive endpoints are shown in **Table 43**; for soybean, the most sensitive dicot, they are as follows: IC_{25} = 0.0000469 lb. a.i./A; and, NOAEC = 0.000014 lb. a.i./A

The equivalent application rate (EEC = 0.000227 lb a.i./A) in Eqn. 2, for one inch of irrigation water exceeds, both the NOAEC and the IC_{25}, meaning that one inch of irrigation would exceed both, the listed and non-listed terrestrial plant species LOC of 1.0.

The depth (in inches) of irrigation water on the one-acre field required to observe a potential phytotoxic effect can also be estimated. Given the EEC $\geq$ IC_{25} (non-listed plants), and EEC $\geq$ NOAEC (listed plants), and the florpyrauxifen-benzyl concentration from the label, to determine the amount of water required in an acre of land which would lead to a potential concern, the **Eqn. 2** is used.

Equation 2a.
Inches of water = **0.21 inches** = [(0.0000469 lbs a.i./Acre) *(Acre-in /102,790 L water) * (453,592 mg/1 lb)] / (0.001 mg/L) (based on the endpoints for the non-listed species of plants).

Equation 2b.
Inches of water = **0.062 inches** = [(0.000014 lbs a.i./Acre) *(Acre-in /102,790 L water) * (453,592 mg/1 lb)] / (0.001 mg/L) (based on the endpoints for the listed-species of plants).

Results from **Eqns. 2a and 2b** show that only 0.062-0.21 inches of irrigation could have a deleterious effect on non-target plants. Furthermore, a resulting volume of water required in an acre of land which would lead to potential concern is given by the **Eqn. 3**.

Equation 3.
Volume (m^3) = 0.062 inches *(0.0254 m/in) * 4046.86 m^2 = **6.4 m^3/A**, for listed-species of plants.

Results from **Eqn. 3** show that only 6.4 m^3 (~1690 gallons) of water, applied over an acre of land could have deleterious effects on non-target listed species of plants.

Use of Contaminated Compost

Composting studies were not submitted for florpyrauxifen-benzyl. Other picolinic acid/pyridine herbicides, such as picloram, aminorpyralid, clopyralid, and halauxifen, have been found to have potentially toxic effects to non-target plants as a result of composting the by-products from crops treated with these chemicals.

As a line of evidence, EFED evaluated two Magnitude of Residue studies in rice commodities (MRIDs 49677816 and 49677818). These studies were conducted using four types of formulation of which two are currently being proposed in this assessment (three liquid formulations: GF-3162, GF-3206, and GF-3301; and a granular formulation: GF-3187). Analyses were conducted in rice and straw; however, for this brief compost analysis only the results of straw are considered. Numerous trials were conducted in five states: AR, LA, MO, CA and MS. Analysis only for florpyrauxifen-benzyl, XDE-848 acid and XDE-848 hydroxy acid was conducted in the study.

Overall, florpyrauxifen-benzyl concentrations ranged from non-detectable (ND, <0.003 µg/g) to 1.81 µg/g; XDE-848 acid concentrations ranged from ND to 0.181 µg/g; and, XDE-848 hydroxy acid concentrations ranged from ND to 0.191 µg/g. These concentrations are compared to potential levels of concern. In soil, the concentrations of concern are estimated as follows:

Estimated level = [0.0000469 lb a.i./acre] × [1/6 inches] × [1/1.33 kg/L] × [4.54 (10^5) mg/lb] × [3.94 inches/dm] × [2.47 (10^{-6}) acres/dm^2] ~ 0.00003 mg a.i./kg soil ~ **0.00003 µg a.i./g**

Where 0.0000469 lb a.i./A is the lowest EC_{25} for vegetative vigor (soybeans), observed in the terrestrial plant toxicity study (MRID 49677762), conducted on florpyrauxifen-benzyl and 1.33 kg/L is the density of the soil used for analysis in an environmental chemistry method/ independent laboratory validation (MRIDs 49677775 & 49677776). It is acknowledged that the straw material, when composted and processed should show material decline; however, note that the highest florpyrauxifen-benzyl concentration observed in straw in the field trials (1.81 µg/g) is over 60,000 times greater than the estimated level of concern (~0.00003 µg/g). Given the persistence of parent and the TTRs observed in several of the laboratory soil metabolism studies, it appears that based on the Total Toxic Residue expected persistence, there is a potential for phytotoxic injury to crops that receive contaminated compost, depending on the residues remaining in compost.

To clear the uncertainty surrounding the possibility of non-target plant injury due to contaminated compost, a compost residue study for florpyrauxifen-benzyl is desirable, along with an associated toxicity study towards plants treated with contaminated compost. Furthermore, environmental chemistry method/independent laboratory validation for the analysis of parent and residues of concern in compost, using an appropriate LOQ would be required.

5.2. Risk Description

5.2.1. Risks to Aquatic Animals

A summary of the maximum florpyrauxifen-benzyl acute and chronic RQ values derived for aquatic animals is shown in **Table 67**. A discussion of the risk profile for aquatic animals is provided for each of the uses is provided below.

Table 67. Summary of maximum aquatic animal RQ values for florpyrauxifen-benzyl based upon the rice and Aquatic (In-Water) uses

Exposure	FW Fish	SW Fish	FW Invert. (water column)	SW Invert. (water column)	FW Invert. (benthic, pore water)	SW Invert. (benthic, pore water)
Rice Use						
Acute	<0.13*	<0.16*	<0.15*	<0.02	<0.01	<0.01
Chronic	0.01	Not Tested	0.02	>0.62**	>0.03**	>0.14**
Aquatic (In-Water) Use @ Maximum Rate						
Acute	<3.1*	<3.7*	<3.6*	<0.56*	<0.04	<0.01
Chronic	0.08	Not Tested	0.21	**>7.4**	>0.13**	>0.52**
Aquatic (In-Water) Use @ Typical Rate						
Acute	< 1.0*	< 1.2*	< 1.2*	<0.19*	<0.01	<0.01
Chronic	0.03	Not Tested	0.07	**>2.5**	>0.04**	>0.17**

Shaded and bold RQ values indicate exceedance of the chronic risk LOC of 1.0, although the magnitude of LOC exceedance is not known with precision.
* Although the acute EECs for aquatic and rice uses (~150 and 6.6 ppb, respectively) exceed or approach the highest concentration tested of the TGAI in acute toxicity tests (~ 40 ppb), multiple lines of evidence suggest a low potential for acute risk (see text for details).
** The potential for exceeding the chronic LOC of 1.0 cannot be accurately determined, nor can it be precluded.

Rice Use

For the proposed rice use, the potential for acute risks to fish and aquatic invertebrates is considered low based on submitted data. In all cases, acute toxicity was not evident up to the functional limit of solubility in the tests (~40 ppb). As a result, all acute toxicity values are non-definitive 'greater-than' (>) values, which in turn results in non-definitive 'less-than' (<) RQ values. Furthermore, acute toxicity data for the degradates and/or the TEP suggest a low acute risk potential when compared against the EEC for rice.

Similarly, chronic risks are not indicated for freshwater fish based on the proposed rice use. Chronic data were not submitted for estuarine/marine fish, and a chronic NOAEC for estuarine/marine fish cannot be estimated using an acute-chronic ratio since all the data are non-definitive. Therefore, chronic risks to estuarine/marine fish could not be determined. Chronic risks to estuarine/marine invertebrates and benthic freshwater invertebrates could not be accurately determined, nor precluded, since the since florpyrauxifen-benzyl caused significant *adverse effects in all treatment levels* (*i.e.,* a NOAEC was not identified). Therefore, depending on where the actual NOAEC lies in relation to the EEC, the chronic risk LOC may or may not be exceeded. Additional studies with definitive NOAEC values would reduce this uncertainty.

Aquatic (In-Water) Use

For the proposed aquatic (in-water) use, the potential for acute risks to fish and aquatic invertebrates is considered low based on submitted data. As discussed previously for the rice use, acute toxicity was not evident up to the limit of solubility in the test systems. Furthermore, acute toxicity data for the TEP and/or degradates suggest a low potential for acute risk when compared to the acute EEC.

Chronic risks to freshwater fish and freshwater invertebrates (water column) associated with the aquatic (in-water) use also appear limited by the functional solubility in the test systems. Chronic data were not submitted for estuarine/marine fish, and a chronic NOAEC for estuarine/marine fish cannot be estimated using an acute-chronic ratio since all the data are non-definitive. Therefore, chronic risks to estuarine/marine fish could not be determined.

For estuarine/marine invertebrates and freshwater invertebrates (benthic), there is indication of potential chronic risks to these taxa based on the proposed aquatic (in-water) use. RQ values exceed 133 and 35 for estuarine/marine invertebrates and freshwater (benthic) invertebrates, respectively. In both of these studies, the NOAEC values are lower than the lowest concentration tested. Therefore, the upper bound of chronic risk is not known. Furthermore, no sediment toxicity data were submitted for two other taxa (*Hyalella azteca, Leptocheirus plumulosus*) which are typically required for pesticides with similar properties as florpyrauxifen-benzyl (40 CFR Part 158).

In addition, there is some uncertainty as to the actual bioavailability of florpyrauxifen-benzyl associated with the aquatic (in-water) use. Because this use represents addition of TEP directly to water and the label specifies up to 150 ppb as a target concentration, it is unclear whether the functional solubility of florpyrauxifen-benzyl would actually achieve 150 ppb under field application conditions relative to those of the laboratory (15-40 ppb). If the in-water application achieves 150 ppb, then current data do not allow for evaluation of risk between the functional solubility in laboratory toxicity studies (~40 ppb) and 150 ppb.

5.2.2. Risks to Aquatic Plants

Based on available toxicity data and mode of action, risks to vascular aquatic plants, and to a lesser extent non-vascular aquatic plants, from the proposed uses of florpyrauxifen-benzyl (and its degradation products) are expected. Furthermore, the higher EECs from the aquatic (in-water) use established higher risk estimates than the rice use. Where these effects occur, they would be expected to also have indirect effects on organisms that occupy higher tropic levels, especially aquatic invertebrates, fish and herbivorous, insectivorous and piscivorous birds and mammals. A summary of the maximum florpyrauxifen-benzyl RQ values for aquatic plants (both vascular and non-vascular) is shown in **Table 68**.

Table 68. Summary of aquatic plant RQ values for florpyrauxifen-benzyl *(exceedances are bolded).*

Exposure	Vascular Plants	Non-vascular Plants
Rice Use		
Listed	**1,400**	0.53
Non-Listed	**410**	<0.17
Aquatic (in-water) Use @ Maximum Rate		
Listed	**31,100**	**12**
Non-Listed	**9,300**	<3.8*
Aquatic (in-water) Use @ Typical		
Listed	**10,400**	4.0
Non-Listed	**3,090**	<1.3*
* EECs for aquatic use (50 and 150 ppb) exceed the highest concentration tested in the non-vascular plant toxicity study (IC_{50} value >38.9 µg a.i./L). Although the RQ values can theoretically exceed the non-listed aquatic plant LOC of 1.0, the actual potential for risks to non-vascular plants cannot be determined with precision.		

As mentioned in section 2.4, in the requested rice use florpyrauxifen-benzyl would generally be contained in a paddy during the growing season, allowing time for transformation/degradation to occur. In contrast, the proposed in-water use may allow for florpyrauxifen-benzyl to move downstream shortly after application, where downstream dilution may be offset by the addition of aliquots of florpyrauxifen-benzyl from multiple users. The extend to which downstream ecosystems are at risk includes a number of factors; including but not limited to: efficacy, persistence and selectivity. Florpyrauxifen-benzyl is a highly efficacious herbicide. In moving water, where hydrolysis may be a dominant degradation pathway, efficacious levels of florpyrauxifen-benzyl may persist after it is transported off-target. This risk is more pronounced in waters below pH 7. Selectivity has not been thoroughly reviewed.

5.2.3. Risks to Terrestrial Animals

Based on available toxicity data, acute and chronic risks to birds from the proposed rice and aquatic-foliar uses of florpyrauxifen-benzyl (and its degradation products) are not expected (**Table 69)**. For mammals, a potential chronic risk to small piscivorous mammals was identified with the maximum proposed aquatic use rate (150 ppb), but chronic RQ values were based on an unbounded NOAEC and a conservative assumption of no chemical metabolism by benthic invertebrates. Although florpyrauxifen-benzyl has a high K_{OW} value, suggesting a potential to bioaccumulate in aquatic food webs, it appears to be metabolized extensively by fish based on laboratory studies.

Acute risks to bees are not expected with the proposed uses for several reasons. First, bees are not attracted to rice. Thus, exposure of bees to florpyrauxifen-benzyl treated rice would presumably be limited to spray drift to blooming plants located adjacent to the effected area. With the aquatic-foliar uses, however, it is possible for bees to be attracted to blooming emergent aquatic vegetation. Second, even when exposure is assumed, florpyrauxifen-benzyl is practically non-toxic on an acute oral and contact basis to honey bees (LD_{50} > 100 µg a.i./bee). Consequently, acute risk to bees is not indicated from either the proposed rice or aquatic-foliar uses.

Chronic toxicity data were not submitted for bees with florpyrauxifen-benzyl. Theoretcially, florpyrauxifen-benzyl it would need to be ~ 100X more chronically toxic to bees compared to its acute toxicity in order for risks to occur based on default (high end) exposure assumptions used by the BeeREX model. There are some indications of much greater chronic toxicity of florpyrauxifen-benzyl to aquatic insect larvae (midge) and mysid shrimp, relative to acute toxicity to aquatic invertebrates. Therefore, chronic risks to bees cannot be precluded based on available data.

Table 69. Summary of maximum RQ values for terrestrial animals for the rice and aquatic-foliar uses

Exposure	Birds	Bees	Mammals
Acute Dose	0.04	<0.02	<0.01
Acute Dietary or Contact	0.011 (dietary)	<0.02 (contact)	NA
Chronic	0.15	NA	1.4*
RQ values based on the maximum EEC. * RQ based on an unbounded NOAEC and assume no metabolism of florpyrauxifen-benzyl by aquatic inverts.			

5.2.4. Risks to Terrestrial Plants

Based on available toxicity data, risks to terrestrial plants from the proposed uses of florpyrauxifen-benzyl (and its degradation products) are expected. Where effects occur, they could also present indirect risks to organisms that occupy higher tropic levels, especially terrestrial invertebrates, birds, and herbivorous mammals. A summary of the florpyrauxifen RQ values for terrestrial plants (monocots and dicots) is shown in **Table 70**.

Table 70. Summary of highest terrestrial plant RQ values for florpyrauxifen-benzyl.

Risk Category	Monocots	Dicots
Rice Use		
Listed	**1.2**	**96**
Non-Listed	0.65	**29**
Aquatic-Foliar Use		
Listed	0.78	**188**
Non-Listed	0.63	**56**
Bolded and shaded values exceed LOC (both listed and non-listed species of 1.0)		

In addition to the risks identified for parent florpyrauxifen-benzyl, risks to terrestrial plants are also indicated for XDE-848 acid, a major degradate of concern. It is important to note that the RQ values presented above are based on the most sensitive species among 4 monocots and 6 dicot plants tested. Therefore, it is instructive to explore the variability in sensitivity of tested terrestrial plants to florpyrauxifen-benzyl and evaluate the extent to which risk concerns would be identified for other species.

Figure 11 contains a summary of the EC_{25} values determined for both florpyrauxifen-benzyl and its acid degradate.

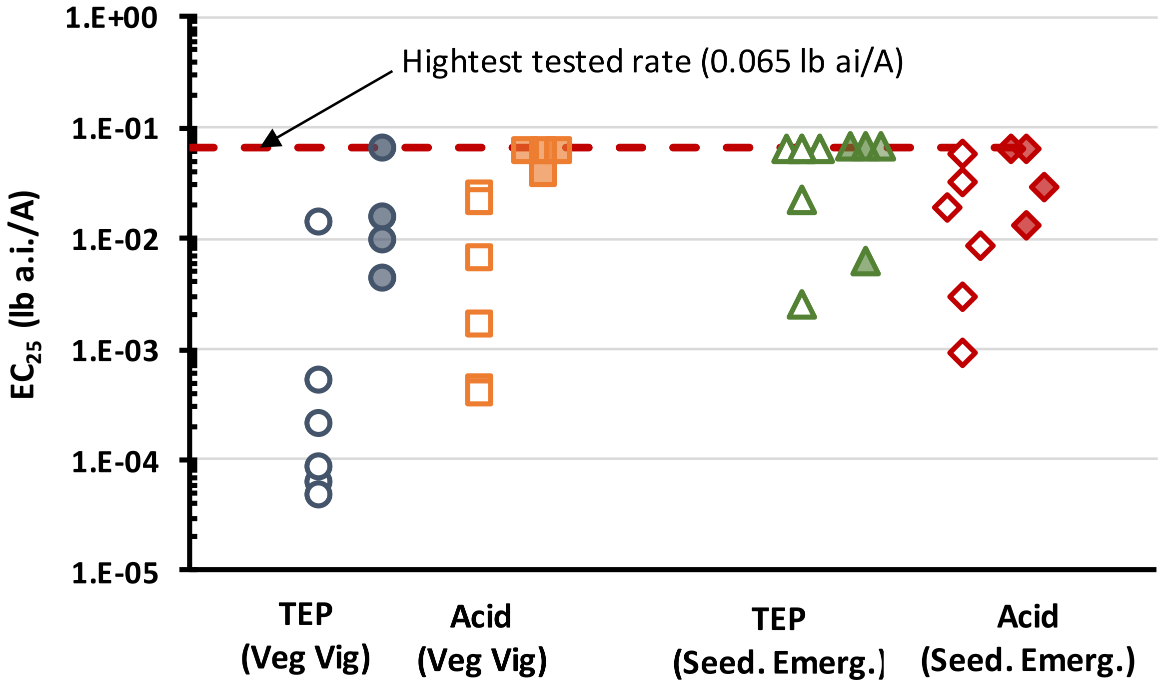


Figure 11. Variation in EC_{25} values for terrestrial plants test with florpyrauxifen-benzyl (TEP) and its acid degradate. (Open symbols = dicots, closed symbols = monocots).

Based on **Figure 11**, it is apparent that the sensitivity of dicots to TEP via the vegetative vigor test spans nearly 3 orders of magnitude (<0.00004 to 0.01 lb a.i./A). Furthermore, 5 out of the 6 tested dicots species would be at risk from both the rice and aquatic-foliar uses. Therefore, the risk findings for dicots are not limited to selecting the most sensitive dicot to determine risks. For monocots, none of the tested species were at risk from the proposed uses based on the non-listed species endpoint.

Spray Drift Analysis

A spray drift analysis was conducted for the ground and aerial applications of florpyrauxifen-benzyl, using AgDRIFT® v.2.1.1, and the vegetative vigor endpoints were found to be more sensitive than the seedling emergence endpoints. Further, the dicot vegetative vigor endpoints were found to be more sensitive than the monocot endpoints. The most sensitive of all terrestrial plant species was the dicot soybean (EC_{25} = 0.0000469 lb a.i./A for vegetative vigor). A buffer zone needed to be below the LOC of 1.0 for terrestrial plants was calculated under ground and aerial conditions. The example label used for this drift analysis was GF-3301 (maximum allowed rate); however, the endpoints belong to GF-3206 (products containing florpyrauxifen-benzyl as the sole active ingredient). A number of spray drift restrictions, including the spray volume, and droplet size category (distribution) are specified in the label (for additional details, refer to **Section 3.1.2**).

For ground applications, the following assumptions were made: high boom height of 50 inches above crop canopy (since for ground applications, the boom height is not specified), American Society of Agricultural and Biological Engineers (ASABE) Fine to Medium/Coarse drop size distribution (DSD) (note that the label specifies Coarse or Coarser DSD; however, the model does not have coarser droplets than Fine to Medium/Coarse), 90th data percentile (default percentile, USEPA 2013).

For aerial applications, the following assumptions were initially made: Tier III Aerial application using ASABE Coarse DSD, spray volume 10 gallons diluted product per acre (gpa) for rice and 15 gpa for the aquatics use (the prepopulated value in the model is only 2 gpa; however, per label, a larger volume is used), wind speed 10 mph (the label recommends 2-10 mph, but *the wind speed language is not mandatory*), air tractor AT-401 (default aircraft), and boom height 10 feet (per label specifications).

The Terrestrial Point module of AgDRIFT calculates the buffer zone required to keep the rate below the LOC. It was found that for the ground applications, the buffer needed ranged from 482 feet for rice use to 886 feet for the aquatics use. For the aerial applications, the buffer zone was 1,683 feet for the rice use and >2,600 feet (out of range) for the aquatics use (**Table 71**).

Table 71. AgDRIFT Buffer Distances to Be Below the Non-Listed LOC for Terrestrial Plant Exposure for Florpyrauxifen-benzyl, Using EFED's Default Conservative Assumptions[1]

Scenario	App. Rate (lb a.i./A)	App. Method	Buffer Distance (ft)	App. Method	Buffer Distance (ft)
Rice	0.0268	Ground	482	Aerial	1,683
Aquatics	0.0527	Ground	886	Aerial	>2,600

Out of range is >2,600 feet for aerial applications.

[1] Assumptions: For ground applications high boom height (50 inches above crop canopy), ASABE Fine to Medium/ Coarse DSD, 90th data percentile. For aerial applications: Tier II Aerial applications using ASABE Coarse DSD, spray volume 10 gpa for rice and 15 gpa for the aquatics use, wind speed 10 mph, air tractor AT-401, boom height 10 feet.

For additional characterization, runs were performed using different less conservative assumptions. For ground applications, the following assumptions were made: low boom height (a low boom height is 20 inches above crop canopy), ASABE Fine to Medium/Coarse DSD (same than above), 90th data percentile (same than above).

For aerial applications, the following assumptions were made: Tier III Aerial application mode, using ASABE Coarse to Very Coarse DSD, spray volume 10 gpa for rice and 15 gpa for the aquatics use, wind speed 10 mph (label recommended, *but not mandatory*), air tractor AT-401 (default aircraft), boom height 10 feet.

As expected, the buffer distances were lower with the less conservative assumptions. It was found that for the ground applications, the buffer needed ranged from 331 feet for rice to 692 feet for aquatics uses. For the aerial applications, the buffer zone was 1,161 feet for the rice use and 2,264 feet for the aquatics use (**Table 72**).

Table 72. AgDRIFT Buffer Distances to Be Below the Non-Listed LOC for Terrestrial Plant Exposure for Florpyrauxifen-benzyl, Using Less Conservative Assumptions[1]

Scenario	App. Rate (lb a.i./A)	App. Method	Buffer Distance (ft)	App. Method	Buffer Distance (ft)
Rice	0.0268	Ground	331	Aerial	1,161
Aquatics	0.0527	Ground	692	Aerial	2,264

[1] Assumptions: For ground applications: low boom height (20 inches above crop canopy), ASABE Fine to Medium/Coarse DSD, 90th percentile. For aerial applications: Tier II Aerial application using ASABE Coarse to Very Coarse DSD, spray volume 10 gpa for rice and 15 gpa for the aquatics use, wind speed 10 mph (label recommended), boom height 10 feet.

For aerial applications, another set of assumptions were made: Tier III Aerial application mode, using ASABE Very Coarse DSD, spray volume 10 gpa for rice and 15 gpa for the aquatics use, wind speed 10 mph (label recommended, *but not mandatory*), air tractor AT-401 (default aircraft), boom height 10 feet.

As expected, the buffer distances were lower with the previous two sets of assumptions, using the Very Coarse droplets. It was found that for the aerial applications, the buffer zone was 846 feet for the rice use and 1,611 feet for the aquatics use (**Table 73**).

Table 73. AgDRIFT Buffer Distances to Be Below the Non-Listed LOC for Terrestrial Plant Exposure for Florpyrauxifen-benzyl, Using Even Less Conservative Assumptions[1]

Scenario	App. Rate (lb a.i./A)	App. Method	Buffer Distance (ft)
Rice	0.0268	Aerial	846
Aquatics	0.0527	Aerial	1,611

[1] Assumptions: Tier II Aerial application using ASABE Very Coarse DSD, spray volume 10 gpa for rice and 15 gpa for the aquatics use, wind speed 10 mph (label recommended), boom height 10 feet.

Figure 12 shows the deposition for the aerial foliar aquatic applications described above, for the Coarse, Coarse to Very Coarse, and Very Coarse DSDs. The figure also depicts the vegetative vigor IC_{25} values for all plant species tested (horizontal lines). The points where the curves intersect the horizontal lines correspond to the buffer zones for each tested species. The x axis is in a *logarithmic* scale. In all cases, the buffer zones are <2,600 feet, with the exception of the Coarse droplet and the dicot soybeans (which was out of range).

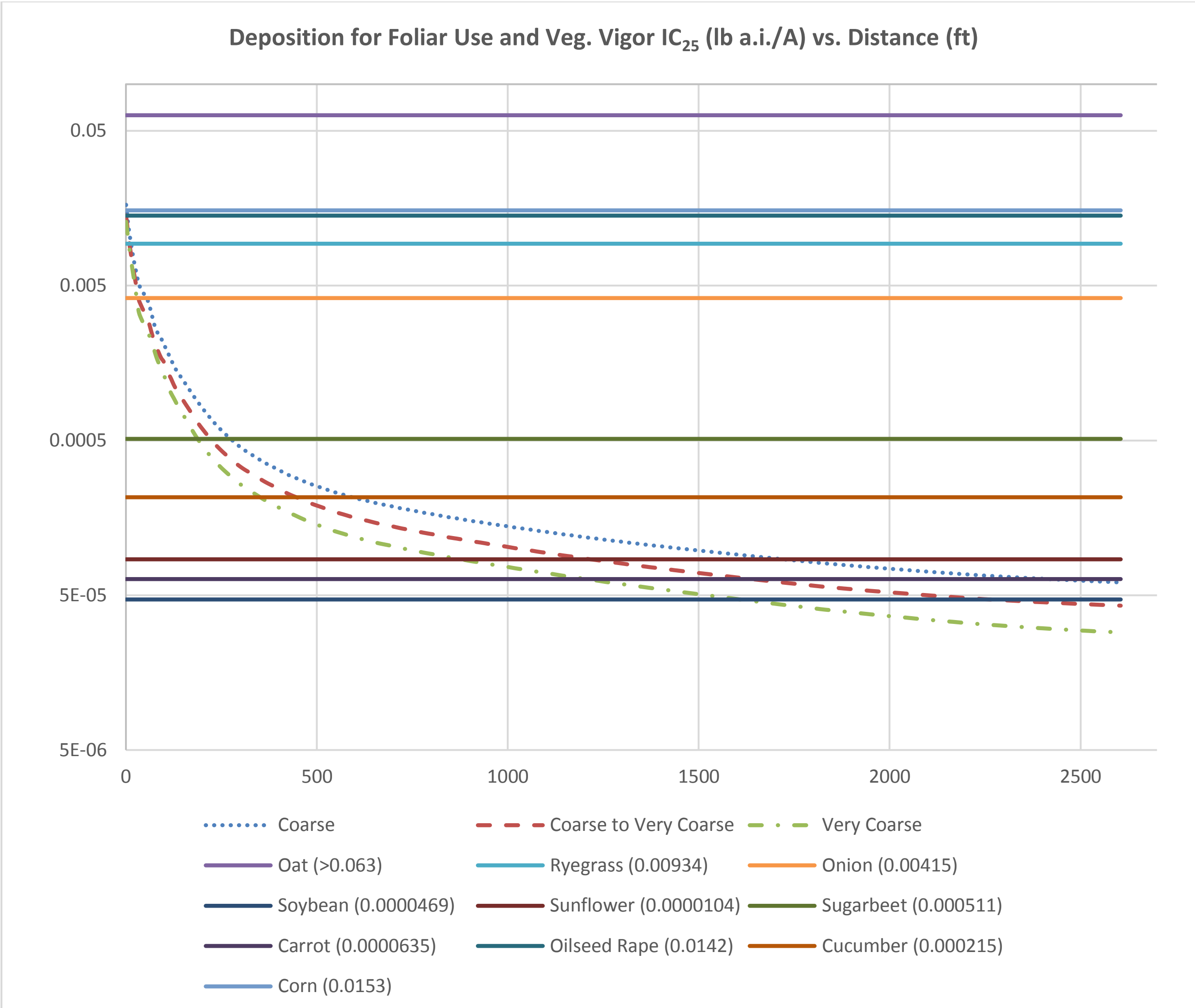


Figure 12. Graph illustrating the Coarse, Coarse to Very Coarse and Very Coarse deposition curves, and the Vegetative Vigor IC_{25} values (horizontal lines) (all in lb a.i./A) against the distance from the edge of the field (feet), for the foliar aerial aquatic applications

Figure 13 shows the deposition for the foliar aerial aquatic applications described above, for the Coarse, Coarse to Very Coarse and Very Coarse DSDs (same than above); however, the figure in this case depicts the vegetative vigor NOAEC or IC_{05} values for all plant species tested (horizontal lines), as opposed to the IC_{25} values depicted in **Figure 12**. The x axis in **Figure 13** was set to be at the same scale than in **Figure 12**, for comparison purposes. The NOAEC or IC_{05} values are lower than the IC_{25}'s; therefore, all crops appear shifted in **Figure 13** and the needed buffer zones to protect listed species are larger than in **Figure 12** for non-listed species. For soybeans, sunflowers and carrots, the buffer zones are clearly above 2,600 feet (out of range), except the Very Coarse droplets and carrots.

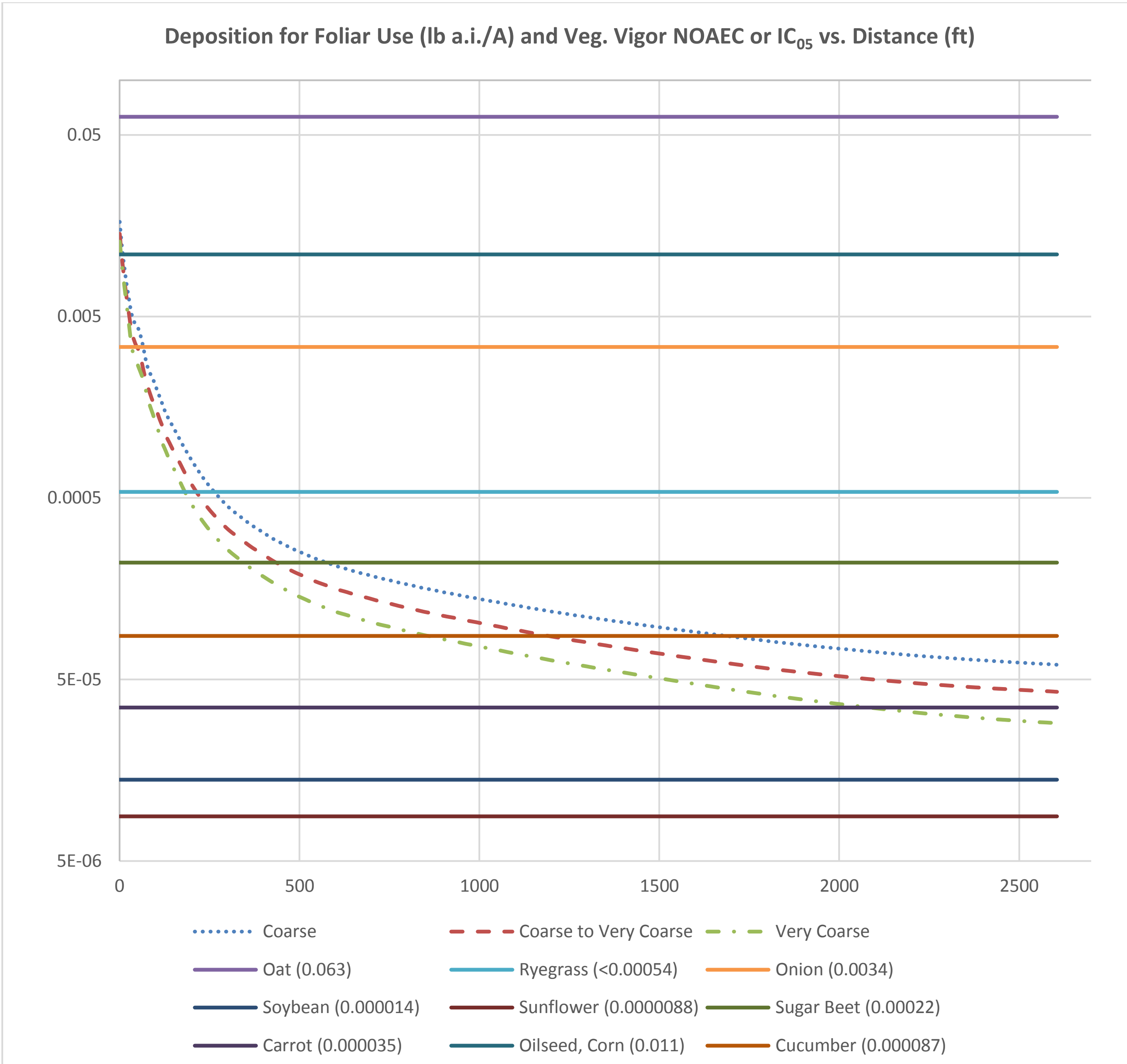


Figure 13. Graph illustrating the Coarse, Coarse to Very Coarse and Very Coarse deposition curves, and the Vegetative Vigor NOAEC or IC_{05} values (horizontal lines) (all in lb a.i./A) against the distance from the edge of the field (feet), for the foliar aerial in-water applications

Additional risks to terrestrial plants (crops) from Co-Formulations

As described in Section 4.4, florpyrauxifen-benzyl has been co-formulated with both cyhalofop and penoxsulam, respectively (a three-way formulation has not been submitted). Based on an initial screening of the plant ecotoxicity data, the cyhalofop co-formulation (GF-3480) demonstrated similar phytotoxicity to soybeans than florpyrauxifen-benzyl alone (0.00003 lb. ai/A vs. 0.00005 lb. ai/A for florpyrauxifen-benzyl alone; MRID 49931707). Of note, this co-formulated endpoint represents the lowest endpoint for crops across all studies.

Similarly, crop toxicity data from the florpyrauxifen-benzyl + penoxsulam co-formulation study (GF-3530) indicates higher toxicity to oilseed rape, and this endpoint value is very similar to the aforementioned florpyrauxifen-benzyl + cyhalofop endpoint for soybeans (0.00004 lb. ai/A; MRID 50005702).

Based on this initial screening, phytotoxicity drift-effects from these co-formulations to soybeans and oilseed rape would be expected to emulate the previously illustrated curves for soybeans exposed to florpyrauxifen-benzyl alone (Figures X & Y). Consequently, co-formulated solution(s) risks to these crops due to spray-drift are virtually identical to those as described for soybean.

5.2.5. Review of Incident Data

Florpyrauxifen is a new active ingredient, therefore no wildlife incidents were reported and no known monitoring data are available.

5.2.6. Uncertainties

5.2.6.1. Environmental Fate Database Issues and Uncertainties

The environmental fate database for florpyrauxifen-benzyl is considered substantially complete. Several of the fate studies were considered supplemental, since certain deficiencies were observed; however, given the high number of studies pointing towards similar conclusions, it is believed that the environmental fate of this compound is relatively well understood.

Besides the aerobic soil and the aerobic aquatic metabolism studies, an aerobic soil (flooded) and anaerobic soil metabolism studies were available. The results of these two soil test systems appear to be representative of what occurs in the rice paddy under aerobic and anaerobic soil conditions when the soils are flooded, and were used in modelling the rice use in lieu of the aerobic aquatic metabolism test systems. The aquatic metabolism was used in modelling the aquatics use pattern, however. For the aerobic and anaerobic aquatic metabolism studies, the systems showed pHs which were from near neutral to alkaline. High pH values in the system could have promoted hydrolysis of the parent compound, and in turn affected the observed parent only half-lives.

For modelling purposes, the TTRs were defined as the sum total of the parent compound florpyrauxifen-benzyl, plus three major degradates observed in the laboratory studies and in the field. The properties of these compounds are different, as shown by their different structures and K_{OC} values available for some of these degradates, ranging from a low of 71.8 mL/g_{OC} for XDE-848 acid, to 32,280 mL/g_{OC} for the parent compound. In order to obtain an estimate of the range of EECs due to this variability, for a subset of scenarios, additional EECs, assuming that the TTRs show the K_{OC} for the acid, was calculated. As expected, the EECs for the TTRs using the acid's K_{OC} were higher.

There is uncertainty in the fate studies conducted with soils and sediments, since high levels of unextracted radioactivity were observed. In the laboratory studies, the extractions were conducted with a relatively polar solvent in all instances. However, a supplemental study was conducted in which three additional solvents with a wide range of dielectric constants were used. No secondary extraction with acetone, hexane and ethyl acetate, at room temperature/ambient conditions, yielded >3% of the applied in the extracts.

In the fate studies conducted in the laboratory, three radiolabeled test substances were used, representing the three rings in the structure of florpyrauxifen-benzyl. For the benzyl-labeled compound, the total recoveries were below guideline requirements (90-110% AR) in many studies. This may be attributed by loss of carbon dioxide, which was typically higher than for the other two radiolabels. The main products of benzyl-labeled florpyrauxifen-benzyl (not noted in other studies), were benzoic acid and/or benzyl alcohol (depending on the study type), both of which the applicant claims are of low toxicological concern. Benzyl alcohol and benzoic acid were not included in the expression of the total toxic residues (TTRs).

Even though the environmental fate data base for florpyrauxifen-benzyl is essentially complete, there are an environmental chemistry method and associated independent laboratory validation in soil (MRIDs 49677775 and 49677776), that were classified as supplemental; however, a new study may be required, since the method's LOQ is two orders of magnitude higher than the most sensitive endpoint related to the plant toxicity studies. For further details, refer to the **Appendix C**.

5.2.6.2. Uncertainties Related to the Aquatic Modelling with PFAM

Based on the PFAM model White Paper, exposure of non-target aquatic organisms to florpyrauxifen-benzyl applied to rice paddies may occur in the following sites (**Figure 14**):

1) The rice paddy;
2) Canals or waters adjacent to the rice paddy;
3) Waterbodies downstream from the canal.

Residues will occur in water whether the pesticide is applied to a dry or flooded field, as after the field is flooded, residues may move from the soil into the water column. (Source of **Figure 14**, PFAM white paper.)

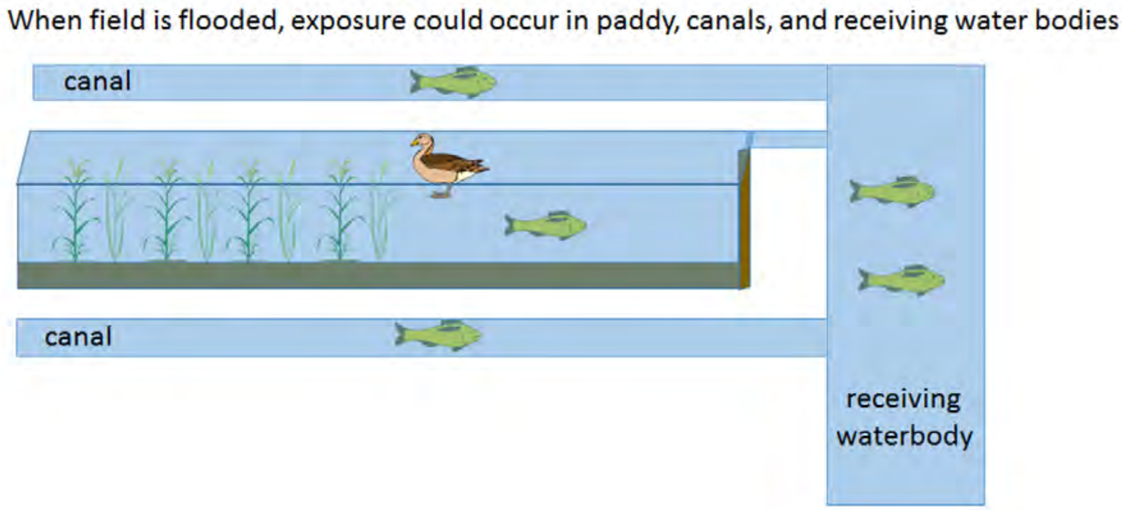


Figure 14. Areas where aquatic organisms may be exposed to pesticides applied in rice growing areas

Rice paddies and canals associated with rice paddies are promoted as an ecological resource, and the water from rice paddies is an important source of water for nearby waterbodies. In the Sacramento Valley, 57% percent of the managed wetlands and 40,000 acres of wetlands use tailwater from the Valley's rice fields (California Rice Commission, 2012). While fish are not as abundant as some of other taxa in the rice paddy, fish have been reported to occur in rice paddies and are abundant in canals and ditches next to rice paddies into which paddy water may be released (Eadie *et al.*, 2008; Pearlstine *et al.*, 2007). Therefore, the assumption that fish may occur in rice paddies is conservative. Fish serve as a surrogate for other aquatic vertebrates such as reptiles and amphibians, which are also documented to utilize rice fields. Crawfish are commonly cultivated in rice paddies in the southern United States (Eadie *et al.*, 2008) and aquatic invertebrates serve as an important food resource for other organisms that utilize rice paddies as a resource (Eadie *et al.*, 2008).

In assessing risk to aquatic animals (*i.e.*, fish, amphibians, invertebrates), exposure is evaluated in the rice paddy for organisms that may move onto the field by comparing toxicity endpoints to estimated exposure in the rice paddy. Exposure estimates are also characterized with concentrations in water that may be released after a specified holding period. These concentrations would represent exposures to organisms located in "receiving waters" (*i.e.*, those that are down stream of the rice paddy). The holding period is assumed to be one day if a holding period is not specified on the label. If a minimum water holding period is specified on the label, exposure is estimated in tailwater after that required minimum holding period. When water is held in the paddy, pesticide residues degrade according to pesticide-specific half-lives. In the ecological risk assessment for rice, a single paddy is simulated. Therefore, maximum application rates on the label are simulated.

As exposure is estimated in the rice paddy for ecological risk assessment, releases of water after an application could reduce exposure in the paddy. It is uncertain to what extent residues in the water would be diluted after the water leaves the rice paddy as some canals that received water from the rice paddies may have little water in them or the water may be coming from releases from rice paddies upstream. It is expected that at least in some areas pesticide concentrations in canals and waters adjacent to the rice paddy are very similar to the pesticide concentrations in the rice paddy. Therefore, to follow the residues in the water and to provide a protective bound for risk to ecological organisms, water should be held on the rice paddy after the application and until harvest. Reports of humans using the canals right next to rice paddies for fishing are common and the canals are often promoted to be a resource for wildlife. It should also be noted that in some areas, water moves from one rice paddy to the next and there have been some cases where residues are applied in one paddy, the water is moved to another paddy, and more pesticide is applied resulting in residues in the water increasing as the water moves from rice paddy to rice paddy.

5.2.6.3. Uncertainties Related to Modeling Aquatics Uses

For the use of florpyrauxifen-benzyl in aquatics sites, the PWC v.1.52 model was used. The model was modified to disallow applications over the field (the crop) by setting the application efficiency to zero (0). Further, the spray drift value was set o 1.00 (100%) in order to have an application rate on the pond at the level desired. In the PWC the same three sets of results were produced (TTRs with the K_{OC} of the parent and the acid, and parent only). The main advantage of the PWC is that it accounts for all the degradation and metabolism dissipation pathways.

It should be noted that the calculated peak EECs were different than the nominal concentrations (in this assessment, the florpyrauxifen-benzyl nominal concentrations modelled were 50 and 150 ppb). In practice, when the chemical is applied in the field in a typical end-use product (TEP), the concentrations of florpyrauxifen-benzyl in water appear to be greater than the native solubility limit, possibly due to the formulation. This is evidenced by the aquatic field dissipation studies, where the observed concentrations, though not at the nominal levels, were high. Further, in the laboratory toxicity studies, when the TEP was tested, much higher concentrations could be achieved, compared to similar studies using the technical grade active ingredient (TGAI).

5.2.6.4. Use of the Maximum Application Rate

For the use on rice, the maximum number of applications is two per season at the maximum rate, in two products that contain solely florpyrauxifen-benzyl. There are two products that contain florpyrauxifen-benzyl plus one other active ingredient, each, for which only one application/season, at around the same single maximum rate, is allowed. Currently, it is unknown how frequently the maximum application rate will be used in the field under typical use conditions per application, how often the minimum or higher retreatment interval will be used, or whether typically one or two applications will be used. In this assessment, the maximum rate (0.0300 kg a.i./ha x 2 applications), with the minimum interval (14 days) was modeled.

For the aquatics use pattern, one application at a typical rate of 50 ppb and another at the maximum rate of 150 ppb/year, were separately modeled. At this time, it is unknown whether these rates are actually representative of what would be typically applied in the field. According to the label, rates range from 10 to 150 ppb per application. Furthermore, multiple applications at lower rates are allowed in the label for up to 150 ppb per season; however, the simple model used to model these applications cannot be used to model multiple applications. Two field dissipation studies were conducted in two sites (FL, NC), using a single application (FL, NC), using a single application at 50 ppb, and another study was conducted in a single site (FL), at the maximum proposed rate of 150 ppb/year.

It is noted that the model assumes rapid establishment of equilibrium in the standard pond and the peak EECs are below the nominal concentration. For acute exposure, it was assumed that the peak concentration was the nominal concentration in lieu of the calculated peak concentration. Further, when an application occurs, it is possible that the initial concentration would be even locally higher than 150 ppb if the equilibrium is not established rapidly.

5.2.6.5. Application Information

Meteorological data and crop profiles from the metadata files and from the White Paper, as well as best professional judgment, and label information, were used to establish an application date for modeling; however, the selected date may not represent the intended, actual or typical application dates. The application dates used for model runs may significantly alter the EECs; thus, EECs reported could over or under predict the potential exposure. The dates of application used in this risk assessment were generally selected based on the crop cycle and label information. According to the labels, applications occur from 2 leaf stage (drill-seeded rice or water-seeded rice) with no exposed roots up to 60 days before harvest. For the purpose of this assessment, the first application was assumed to be in water and set to occur (assumed), for Arkansas, Louisiana, Mississippi, Missouri, Texas to occur 7 days after zero height reference. It is unclear how much the application dates differ from the typical timing of application, which is based on pest pressure, and in some instances, the weather forecast. For example, in the field dissipation studies conducted on rice fields, applications occurred at intervals which were above the minimum allowed by the label (14 days). Further, two types of scenarios were conducted: dry seeded (in Texas) and wet seeded (in California). [Currently, the label does not allow applications of the chemical on rice in California.]

5.2.6.6. Number of Seasons per Year

In this assessment, one season per year was assumed for the rice use (*i.e.*, a maximum of two applications at the maximum rate). In the U.S., rice is typically grown in one season per year; however, according to the White Paper for PFAM, ratoon crops can also be harvested: "Several factors are critical to successful ratoon crop production, or second/stubble rice production. The earlier the ratoon crop matures, the higher its potential yield. Therefore, rapid stimulation of re-growth is an important factor. Soils are kept moist with a shallow flood until re-growth has advanced and re-tillering has occurred. According to the International Rice Research Institute (1988), appearance of first tiller varies from 1 to 10 days after cutting. The field should be moist but not flooded for 2 weeks at the end of the main crop. After re-tillering, a flood is maintained to control weeds. The duration of the ratoon crop can range from 40 to 135 days. This practice results in an average ratoon duration of 88 days (International Rice Research Institute, 1998)." Later, the White Paper says that, "According to the *Texas Rice Production Guidelines* (Way and McCauley, 2012), fields should not be flushed after harvest. Flushing permits the germination of rice grain residue from harvesting, and the germinated rice seeds become weeds that compete for nutrients and light. Time does not permit them to produce panicles. Flooding immediately after harvest prevents the germination of these seeds through the formation of an anaerobic layer near the soil surface (Way and McCauley, 2012)."

Per the example label for GF-3206, instructions indicate that, "Do not make more than 2 applications or apply more than 32 fl oz of GF-3206 per acre during the growing season (maximum of 16 fl oz per application) in both the first and ratoon crops combined." The reviewer has interpreted that this means that a maximum of two annual applications are allowed.

5.2.6.7. Ecological Based Uncertainties to the Risk Assessment

Uncertainties for All Taxa

There are a number of areas of uncertainty in aquatic and terrestrial risk assessment. The toxicity assessment for plants and animals is limited by the number of species tested in the available toxicity studies. Use of toxicity data on representative species does not provide information on the potential variability in susceptibility among species to acute and chronic exposures.

This risk assessment relies on best available estimates of environmental fate and physicochemical properties, maximum application rate, application frequency and interval of/for florpyrauxifen-benzyl. However, several uncertainties and model limitations are noted and should be considered in interpreting the results of this aquatic risk assessment.

Uncertainties related to risks to aquatic plants and animals that are exposed florpyrauxifen-benzyl

1. Florpyrauxifen-benzyl (TGAI) has a native solubility of ~ 15 µg/L, which is frequently below the acute toxic-effect level for the surrogate species used in the studies (with the addition of solvents such as DMF, solubility was enhanced to ~50 µg/L). For many surrogate species, 50 µg/L was either below the response threshold, or if there was a dose-response, the response did not reach the endpoint being measured (*e.g.*, LC_{50}). Consequently, many toxicology studies were non-definitive (because they established unbounded endpoint values), including: 6 of 6 acute fish studies, 1 of 1 chronic fish study, 5 of 6 acute invertebrate studies, 1 of 2 chronic invertebrate studies, 5 of 6 algae studies and 1 of 2 *Lemna* studies. In general, these studies are informative only up to the highest level tested.
2. In aqueous environments florpyrauxifen-benzyl eventually changes into one or more transformation products, and the exact identity of the transformation product portfolio that is produced, as well as the rate of production of the transformation products, depends on a multitude of aqueous environmental factors, such as temperature, mixing, water clarity, exposure to sediment and sediment composition. Consequently, risks associated with the rice and aquatics in-water use for aquatic plants are presented via Total Toxic Residue (TTR) values that are associate with the two most prominent toxic components: florpyrauxifen-benzyl and florpyrauxifen-acid, to span a range of mobility characteristics for the TTRs.
3. Studies using transformation products were not performed on birds, bees, mammals and monocots. As these are terrestrial organisms, exposure to transformation products is expected to be limited and studies conducted with florpyrauxifen-benzyl were sufficient to represent transformation product toxicity.
4. Because florpyrauxifen-benzyl is proposed as an herbicide to be applied to moving bodies of water (streams, rivers, etc.), uncertainty exists with regards to a.) the amount of time the herbicide resides with target organisms, and b.) the amount of time the herbicide resides downstream with non-target organisms. Furthermore, because the Total Toxic Residue (TTR) is considered relatively stable (based on hydrolysis alone), a time-point to the end of the effects, and thus downstream risks to aquatic plants, cannot be easily estimated.
5. Only one benthic study was performed, a 10-day Sub-chronic test using Midge (*Chironomus dilutus*), and benthic studies using *Hyalella azteca* (850.1735) and *Leptocheirus plumulosus* (850.1740) were not submitted. This study resulted in an unbounded "<" less-than NOAEC. Consequently, in the absence of other data, concentration-based limits to risks to the benthic animal community cannot be defined.
6. A Fish Early-Life Stage toxicity test (ELS) (850.1400) was not submitted for estuarine/marine fish species. Consequently, effects due to exposure to florpyrauxifen-benzyl, and its transformation products, to this taxon are an area of uncertainty.

7. In general, model output values represent the upper-bound estimates of concentrations that might be observed, given available data and model limitations. Conversely, should off-label use or synergistic tank-mix effects be realized, the aforementioned models may not be reliable.

For estuarine/marine invertebrates (mysids, chronic), benthic invertebrates (midge) NOAEC values were not established (due to an unbounded low-end level). Because no ‘effect floor’ was established in these studies, statistically-significant effects below 1 to 4 µg/L should be expected

Uncertainties related to risks to terrestrial plants and animals that are exposed florpyrauxifen-benzyl

1. Florpyrauxifen-benzyl is not proposed for use in terrestrial environments. Consequently, all drift related risks are, by definition, risks to non-target organisms. Furthermore, the RQ values established for non-target plants (crops) are several orders-of-magnitude higher than the RQ values for animals.
2. In terrestrial environments, florpyrauxifen-benzyl eventually changes into one or more transformation products, and the exact identity of the transformation product portfolio that is produced, as well as the rate of production of the transformation products, depends on a multitude of environmental factors, such as temperature, rainfall, exposure to sunlight, and soil composition.
3. Non-definitive “<” less-than RQ values, which result from “>” greater-than toxicity endpoint values are the primary uncertainty related to risks to terrestrial animals. That said, additional testing at higher levels may not be warranted because the EEC was below the highest dosage level used in the studies.
4. With the exception of florpyrauxifen-acid, transformation products were tested on only dicots, creating an uncertainty in risk assessment for this taxa.

Incidental Pesticide Releases Associated with Use

This risk assessment is based on the assumption that the entire treatment area is subject to florpyrauxifen-benzyl’s application at the concentrations and rates specified on the labels. This includes the assumption of an even rate application rate across an entire field (paddy) or even dilution throughout an entire body of water. In reality, there is the potential for uneven distribution of florpyrauxifen-benzyl through such plausible incidents as changes in calibration of application equipment, spillage, the inability to ensure mixing, partitioning of active ingredient into sediment (as well as subsequent release of that material).

Age Class and Sensitivity of Effects Thresholds
It is generally recognized that test organism age may have a significant impact on the observed sensitivity to a toxicant. The risk assessment acute toxicity data for fish are collected on juvenile fish and aquatic invertebrate acute testing is performed on recommended immature age classes. Similarly, acute dietary testing with birds is also performed on juveniles, with mallard being 5-10 days old and quail at 10-14 days of age. As juvenile organisms do not have fully developed metabolic systems, they may not possess the ability to transform and detoxify xenobiotics equivalent to the older/adult organism. Consequently, testing of juveniles may be protective of older age classes. In so far as the available toxicity data may provide ranges of sensitivity information with respect to age class, the risk assessment uses the most sensitive life-stage information as the conservative endpoint.

5.3. Threatened and Endangered Species Concerns

Federally Threatened and Endangered (Listed) Species of Concern

Consistent with the Agency's responsibility under the Endangered Species Act (ESA), the Agency evaluates risks to listed species from registered use of florpyrauxifen-benzyl. This assessment is conducted in accordance with the Overview Document (USEPA, 2004), provisions of the Endangered Species Act (ESA), and the Services' *Endangered Species Consultation Handbook* (USFWS/NMFS, 1998).

Action Area

For listed species assessment purposes, the action area is considered to be the area affected directly or indirectly by florpyrauxifen-benzyl use and not merely the immediate area where florpyrauxifen-benzyl is applied. At the initial screening-level, the risk assessment considers broadly described taxonomic groups and conservatively assumes that listed species within those broad groups are co-located with the pesticide treatment area. This means that terrestrial plants and wildlife are assumed to be located on or adjacent to the treated site, and aquatic organisms are assumed to be located in a surface water body adjacent to the treated site. The assessment also assumes that listed species are located within an assumed area which has the highest relative potential exposure to the pesticide, and that exposures are likely to decrease with distance from the treatment area. **Section 3.1** of this risk assessment presents the proposed pesticide use sites that are used to establish initial co-location of species with treatment areas.

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Appendices

Appendix A. Ecological Effects Data Summaries

A.1. Aquatic Animal Summaries

A.1.1. Aquatic Invertebrate Studies

A 48-hr. acute, static-renewal limit test using *Chironomus riparius* (MRID # 49677724) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids* and *OECD 235, Chironomus sp., Acute Immobilization Test*. Both the negative control and the solvent control experienced mortality (2/20), the limit of acceptability for this parameter. Mortality (3/20) was also observed at the 0.0563 mg a.i./L (mean-measured concentration value) level, and in the absence of additional information this mortality is considered dose related. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >0.0563 mg a.i./L. No treatment-related effects were observed at or below the 0.0563 mg a.i./L level. Lethargy was observed in one midge in the negative control at 24 hours, in the solvent control at 48 hours, and in the 0.0563 mg a.i./L treatment group at both 24 and 48 hours. These sub-lethal effects were not statistically-significant were considered to be non-dose-related. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 48-hr. acute static-renewal test using *Daphnia magna*. (MRID # 49677725) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} of >0.0626 mg a.i./L. No treatment-related effects were observed at or below the 0.0626 mg a.i./L level. One mortality was observed at the 0.0153 mg a.i. /L (mean-measured concentration value) level, but it was considered non-dose-related. No sub-lethal effects were observed during the test. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 48-hr. acute static test using *Daphnia magna*. (MRID # 49677726) was conducted on XDE-848 acid (X11438848) following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} of >91.8 mg/L. One immobilization (mortality) was observed at the 13.2 mg/L concentration level, one was observed at the 25.4 mg/L concentration level, four were observed at the 52.4 mg/L concentration level, and six were observed at the 91.8 mg/L concentration level. No treatment-related effects were observed at or below the 52.4 mg/L level. This test was conducted in a Static, not Static-Renewal, format. No sub-lethal effects were observed during the test. This study is classified as acceptable.

A definitive, 48-hr. acute static-renewal test using *Daphnia magna*. (MRID # 49677727) was conducted on XDE-848 hydroxy acid (X11966341) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} of >100 mg/L. No immobility or sub-lethal effects were observed after 48 hours in the control or treatment groups. No sub-lethal effects were observed during the test. This study is classified as acceptable.

A definitive, 48-hr. acute static-renewal test using *Daphnia magna*. (MRID # 49677728) was conducted on des-chloro XDE-848 acid (X12393505) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} of >110 mg/L. No treatment-related effects were observed during the test. This study is classified as acceptable.

A definitive, 48-hr. acute static-renewal test using *Daphnia magna*. (MRID # 49677729) was conducted on des-chloro XDE-848 benzyl ester (X12131932) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} of >0.98 mg/L. No treatment-related effects were observed during the test. Although compound stability varied widely across time-points, the lack of effect on the study organisms mitigates this deficiency. This study is classified as acceptable.

A definitive, 48-hr. acute static-renewal test using *Daphnia magna*. (MRID # 49677730) was conducted on nitro hydroxy acid (X12483137) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} of >10 mg/L. No treatment-related effects were observed at or below the 10 mg/L level. No treatment-related effects were observed during the test. This study is classified as acceptable.

A definitive, 96-hr. acute flow-through test using *Gammarus pseudolimnaeus*. (MRID # 49677731) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1020 – Gammarid Acute Toxicity Test*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >0.0419 mg a.i./L. Mortality was observed at all concentration levels, but these mortalities were not monotonic and were considered non-dose-related. No sub-lethal effects were observed during the testing period. In summary, no treatment-related effects were observed at the 0.0419 mg a.i./L level and below. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. acute flow-through test using the Great Pond Snail (*Lymnaea stagnali*). (MRID # 49677732) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1020 – Gammarid Acute Toxicity Test*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} >0.0482 mg a.i./L. Mortality was observed in both the negative control and the solvent control as well as the 0.0232 mg a.i./L and 0.0482 mg a.i./L concentration levels, but these mortalities were considered non-dose-related, and an LC_{50} could not be established. No sub-lethal effects were observed during the testing period. In summary, no treatment-related effects were observed at the 0.0482 mg a.i./L level and below. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. acute shell-deposition, flow-through test (MRID# 49677733) using Eastern Oyster (*Crassostrea virginica*) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1025 – Oyster Acute Toxicity Test (Shell Deposition)*. No mortalities were reported in the control or study groups, thus a non-definitive EC_{50} of >0.0251 mg a.i./L was established. All concentration levels experienced ≤50% Mean Percent Reduction in shell growth, consequently this test established a non-definitive IC_{50} of >0.0251 mg a.i./L. No additional sub-lethal effects were observed during the testing period, consequently a non-definitive NOAEC was established at 0.0251 mg a.i./L. Due to the non-definitive IC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr acute flow-through test using *Americamysis bahia* (MRID # 49677734) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1035 – Mysid Acute Toxicity Test*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >0.026 mg a.i./L. Mortality was observed in both the negative control and the solvent control, but neither exceeded 10%. Although mortality was observed at the three highest concentration levels, these mortalities were considered non-dose-related (due to the presence of similar levels of control mortalities). No sub-lethal effects were reported. In summary, no statistically-significant treatment-related effects were observed at or below the 0.026 mg a.i./L level. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 21-day chronic static-renewal test using *Daphnia magna*. (MRID # 49677744) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1300 – Daphnia Chronic Toxicity Test*. The testing established a NOAEC of 0.0385 mg a.i./L and a LOAEC of >0.0385 mg a.i./L (mean-measured concentration value). Both Total Organic Carbon and particulate values were not reported. This study is classified as acceptable.

A definitive, 21-day chronic static-renewal test using *Daphnia magna*. (MRID # 49677745) was conducted on XDE-848 acid (X11438848) following EPA/OPPTS *Ecological Effect Test Guideline 850.1300 – Daphnia Chronic Toxicity Test*. The testing established a NOAEC of 25.9 mg/L and a LOAEC of >52.9 mg/L (mean-measured concentration value). A statically-significant reduction in the Mean Number of Young per Surviving Adult was observed at the 52.9 mg/L concentration level. Consequently, a NOAEC of 25.9 mg/L was established for this study. Two immobilizations (mortalities) were observed at the 6.68 mg/L concentration level, and two additional immobilizations (mortalities) were observed at the 52.9 mg/L concentration level. These mortalities were considered non-dose-related. Reported salinity values were out-of-range for this parameter during this study. Both Total Organic Carbon and particulate values were not reported. This study is classified as acceptable.

A definitive, 28-day life-cycle flow-through test using *Americamysis bahia* (MRID # 49677746) was conducted using florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1350 – Mysid Chronic Toxicity Test*. During this study the <u>Number of Offspring per Female</u> was statistically significantly reduced at the 0.0078 mg a.i./L level (26.5% fewer offspring produced) and at the 0.013 mg a.i./L level (45.5% fewer offspring produced), using mean measured concentration values. The <u>Number of Offspring per Female</u> was also reduced at the 0.0011 mg a.i./L level (21.8% fewer offspring produced), reduced at the 0.002 mg a.i./L level (22% fewer offspring produced) and reduced at the 0.0035 mg a.i./L level (15.8% fewer offspring produced), using mean measured concentration values. <u>Female Total Body Length</u> was statistically-significantly reduced at all concentrations. For the 0.0011 mg a.i./L, 0.002 mg a.i./L, 0.0035 mg a.i./L, 0.0078 mg a.i./L and 0.013 mg a.i./L (mean-measured) test concentration levels, the Female Body Length (mm) dropped -3.1%, -2.6%, -2.9%, -2.9%, and -4.7%, respectfully. <u>Male Total Body Length</u> was reduced at the 0.0011 mg a.i./L level, but this effect was considered non-dose related. <u>Mortalities</u> in the F_1 generation occurred at all concentration levels, including the control, but again, these mortalities were considered non-does related. <u>Percent Survival</u> (Mortality) in adult Mysids was not statistically significantly-reduced during the study. Although <u>Dry Body Weight</u> was not statistically significantly-reduced in any of the testing groups, a clear downward trend (towards lower weight as concentration increased) was established during the test.

In conclusion, the percent effect of florpyrauxifen-benzyl on female length relatively small (3% to 5%, but monotonic), and view independently of the effect on offspring per female a more conservative NOAEC of 0.0035 mg a.i./L, LOAEC 0.0078 mg a.i./L might have been established (based on Williams Multiple Comparison Test). However, this interpretation was not favored due to the similarity in dose-response pattern that offspring-per-female and female-length share. That is, because both variables responded to florpyrauxifen-benzyl with similar dose-response curves and these results are considered biologically significant, the more protective (and statistically significant) endpoint is given priority. A non-definitive NOAEC of <0.0011 mg a.i./L and a

LOAEC of >0.020 mg a.i./L was established in test. Due to the establishment of an unbounded (low-end), non-definitive NOAEC, this study is classified as supplemental (quantitative).

A definitive, 10-day, sub-chronic whole-sediment test on *Chironomus dilutus* (MRID # 49677750) was conducted using florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1735 – Whole Sediment Acute Toxicity Invertebrates, Freshwater*. For Dry Weight and Ash-Free Dry Weight (AFDW), the testing established a NOAEC of <0.00432 mg a.i. /L and a LOAEC of 0.00432 mg a.i. /L in pore-water, as well as a NOAEC of <5.25 mg a.i. /kg and a LOAEC of 5.25 mg a.i. /kg in sediment. All analyses were conducted using the mean-measured concentrations. The TOC concentration of the sediment was not reported, therefore, OC-normalized concentrations could not be reported. Due to the establishment of an unbounded (low-end), non-definitive NOAEC, this study is classified as supplemental (quantitative).

Table A.1. Most-sensitive endpoint data for Aquatic Invertebrates tested with TGAI or TEP

Taxon MRID	Study Format	Material	*Species* Guideline	Most-sensitive Endpoint *& Category*
Benthic Invertebrates 49677750 *(Acceptable)*	10-Day Whole Sediment	TGAI	Midge (*Chironomus riparius*) 850.1735	*Ash-free Dry Weight* Pore-water NOAEC < 0.00432 *(mg ai/L)* Pore-water LOAEC: 0.00432 *(mg ai/L)* Sediment NOAEC: <5.25 *(mg ai/kg)* Sediment LOAEC: 5.25 *(mg ai/kg)*
				Survival Pore-water NOAEC: 0.0346 *(mg ai/L)* Pore-water LOAEC: > 0.0346 *(mg ai/L)* Sediment NOAEC: 83.2 *(mg ai/kg)* Sediment LOAEC: > 83.2 *(mg ai/kg)*

A definitive, 28-day chronic whole-sediment test with *Chironomus riparius* (MRID # 49677804) was conducted on florpyrauxifen-benzyl following *OECD Guideline 219* (adopted 2004) "*Sediment-Water Chironomid Toxicity Test Using Spiked Water*". This study does not fulfill a current U.S. EPA data requirement, but it provides some useful supplemental information about the species in a water/sediment system. For 28-Day Emergence Rate, the testing established a NOAEC of 0.00042 mg a.i./L and a LOAEC >0.00042 mg a.i./L in pore-water, as well as a NOAEC of 0.025 mg a.i./kg and a LOAEC of ≥0.025 mg a.i./kg in sediment. For 28-Overall Development Rate, the testing established a NOAEC of 0.00042 mg a.i./L and a LOAEC of ≥0.00042 mg a.i./L in pore-water, as well as a NOAEC of 0.025 mg a.i./kg and a LOAEC of ≥0.025 mg a.i./kg in sediment. For 28-Survival Rate, the testing established a NOAEC of 0.00042 mg a.i./L and a LOAEC of ≥0.00042 mg a.i./L in pore-water, as well as a NOAEC of 0.025 mg a.i./kg and a LOAEC of ≥0.025 mg a.i./kg in sediment.

This 28-day chronic whole-sediment test on *Chironomus riparius* (MRID # 49677804) simultaneously produced endpoint data on the XDE-848 acid degradant (X11438848). For 28-Day Emergence Rate, the testing established a NOAEC of 0.0068 mg/L and a LOAEC of ≥0.0068 mg/L in pore-water, as well as a NOAEC of 0.007 mg/kg and a LOAEC of ≥0.007 mg/kg in sediment. For 28-Overall Development Rate, the testing established a NOAEC of 0.0068 mg/L and a LOAEC of >0.0068 mg/L in pore-water, as well as a NOAEC of 0.007 mg/kg and a LOAEC of ≥0.007 mg/kg in sediment. For 28-Survival Rate, the testing established a NOAEC of 0.0068 mg/L and a LOAEC of ≥0.0068 mg/L in pore-water, as well as a NOAEC of 0.007 mg/kg and a LOAEC of ≥0.007 mg/kg in sediment.

Data from both the Pore Water and Sediment segments of this study produced endpoints (both NOAEC and LOAEC) which were less than the EEC. Furthermore, knowing that the study was conducted with spiked-water, not spiked-sediment, this study is classified as supplemental (quantitative) with respect to the use of the both the florpyrauxifen-benzyl and the XDE-848 acid compounds.

A definitive, 28-day, chronic whole-sediment test on *Chironomus dilutus* (MRID # 50017201) was conducted using XDE-848 hydroxy benzyl ester (X12300837) following *OECD Guideline 218* (adopted 2004) "*Sediment-Water Chironomid Toxicity Test Using Spiked Sediment*". This study is currently under review. An initial screening of the data indicated that Measured Pore Water concentration curve had a significant decrease at the 500 mg/kg nominal sediment concentration level (a 26% decrease as compared to the 250 mg/kg concentration level), where a 2x fold increase would have been expected. Consequently, reliability of the reported NOAEC/LOAEC levels is uncertain. Furthermore, both the mean percent-emergence and percent-survival values demonstrate significant non-monotonicity.

A definitive, 28-day, chronic whole-sediment test on *Chironomus dilutus* (MRID # 50017202) was conducted using XDE-848 hydroxy acid (X11966341) following *OECD Guideline 218* (adopted 2004) "*Sediment-Water Chironomid Toxicity Test Using Spiked Sediment*". This study is currently under review. An initial screening of the data indicated that no statistically-significant, monotonic effect was established for either the male development, female development or survival endpoints. Should this initial screening withstand further analysis, the resulting LOAEC would be > 470 mg/L (mean-measured value).

A definitive, 48-hr. acute static-renewal test using *Daphnia magna*. (MRID # 49677909) was conducted on florpyrauxifen-benzyl Typical End-Use Product (TEP) GF-3206 following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. The testing established a definitive EC_{50} of = 1.32 mg ai/L. No treatment-related effects were observed at or below the 0.700 mg ai/L level and below. No solvent control was utilized during this study. However, the TEP appears to enhance the apparent solubility of florpyrauxifen-benzyl in water, and as a result, concentrations achieved in the study were higher. This study is classified as acceptable.

A definitive, 48-hr. acute static-renewal using *Daphnia magna*. (MRID # 49678009) was conducted on florpyrauxifen-benzyl Typical End-Use Product (TEP) GF-3301 following EPA/OPPTS *Ecological Effect Test Guideline 850.1010 – Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive EC_{50} of >22.2 mg ai/L (Time-Weighted Average). No treatment-related effects were observed at or below the 22.2 mg a.i./L level. No solvent control was utilized during this study. This study is classified as acceptable.

A definitive, 96-hr. acute shell-deposition, flow-through test (MRID# 49678010) using Eastern Oyster (*Crassostrea virginica*) was conducted on Typical End-Use Product (TEP) GF-3301 (26.8% a.i., nominal) following EPA/OPPTS *Ecological Effect Test Guideline 850.1025 – Oyster Acute Toxicity Test (Shell Deposition)*. One mortality was recorded at the 0.190 mg a.i./L, Time-Weighted Average (TWA) level, but this mortality was considered non-dose-related. No other mortalities were reported, thus a non-definitive IC_{50} of >0.270 mg a.i./L (TWA) was established. All concentrations experienced ≤50% growth inhibition, consequently a non-definitive IC_{50} of >0.270 mg a.i./L (TWA) was established. No additional sub-lethal effects were observed during the testing period. This study is classified as acceptable.

A definitive, 96-hr. acute flow-through test using *Americamysis bahia* (MRID # 49678011) was conducted on Typical End-Use Product (TEP) GF-3301 (26.8% a.i., nominal) following EPA/OPPTS *Ecological Effect Test Guideline 850.1035 – Mysid Acute Toxicity Test*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >0.370 mg a.i./L (Mean Measured). No sub-lethal effects were observed during the testing period. No solvent control was used during the test. This study is classified as acceptable.

A.1.2. Fish Studies

A definitive, 96-hr. acute flow-through test on Rainbow Trout (*Oncorhynchus mykiss*) (MRID # 49677735) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No lethal effects were observed during the study, consequently this test established a non-definitive LC_{50} of >0.049 mg a.i./L (mean-measured concentration value). Sub-lethal discoloration was observed at the 0.0123 mg a.i./L, 0.0241 mg a.i./L and 0.049 mg a.i./L concentration levels. No treatment-related effects were observed at or below the 0.007 mg a.i./L level. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. acute flow-through test on Fathead Minnow (*Pimephales promelas*) (MRID # 49677736) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >0.0518 mg a.i./L. No treatment-related effects were observed at or below the 0.0518 mg a.i./L level. No sub-lethal effects were observed during the study. This study was conducted in a pH-range above the prescribed value range for that parameter. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. acute flow-through test on Sheepshead Minnow (*Cyprinodon variegatus*) (MRID # 49677737) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >0.0403 mg a.i./L. No treatment-related effects were observed at or below the 0.0403 mg a.i./L level (mean-measured concentration value). No mortality or sub-lethal effects were observed during the study. This study was conducted in a salinity-range above the prescribed range for that parameter. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. acute static-renewal test on Common Carp (*Cyprinus carpio*) (MRID # 49677738) was conducted on des-chloro XDE-848 acid (X12393505) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >90 mg a.i./L (mean-measured concentration value). No lethal or sub-lethal effects were observed during the study. This study is classified as acceptable.

A 96-hr. acute static-renewal limit test on Common Carp (*Cyprinus carpio*) (MRID # 49677739) was conducted on des-chloro XDE-848 benzyl ester (X12131932) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No lethal or sub-lethal effects were observed during the study, consequently the testing established a non-definitive LC_{50} of >1 mg/L. This study was conducted in a pH-range above the prescribed value range for that parameter. Finally, although a low dosing level (1 mg/L) and a low number of test organisms (n = 10) were used (creating lower statistical confidence), this study is classified as acceptable due to the lack of effect by the compound on the study organisms.

A 96-hr. acute static-renewal limit test on Common Carp (*Cyprinus carpio*) (MRID # 49677740) was conducted on XDE-848 hydroxy acid (X11966341) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No treatment-related effects (lethal or sub-lethal) were observed at or below the 120 mg/L level (mean-measured concentration value), thus this testing established a non-definitive LC_{50} of >120 mg/L. This study is classified as acceptable.

A definitive, 96-hr. acute static-renewal test on Rainbow Trout (*Oncorhynchus mykiss*) (MRID # 49677741) was conducted on the XDE-848 acid (X11438848) following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No lethal or sub-lethal effects were observed during the study. All concentrations experienced $\leq$50% mortality, consequently this test established a non-definitive LC_{50} of >99.4 mg/L (mean-measured concentration value). This study is classified as acceptable.

A definitive, 96-hr. acute static-renewal test on Common Carp (*Cyprinus carpio*) (MRID # 49677742) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No lethal or sub-lethal effects were observed during the study. The testing established a non-definitive LC_{50} of >0.0414 mg a.i./L (mean-measured concentration value). This study was conducted in a pH-range above the prescribed value range for that parameter. Due to the non-definitive LC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. acute static-renewal test on Common Carp (*Cyprinus carpio*) (MRID # 49677743) was conducted on nitro hydroxy acid (X12483137) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No mortalities were observed during the test, thus a non-definitive LC_{50} of >9.6 mg/L was established (mean-measured concentration value). One sub-lethal effect (spinal curvature) was observed at the 4.8 mg/L level (mean-measured concentration value), but this effect was considered non-dose-related. This study is classified as acceptable.

A definitive, 33-day Early-Life Stage flow-through test on Fathead Minnow (*Pimephales promelas*) (MRID # 49677747) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.1400 – Fish Early-Life Stage Toxicity Test.* All concentrations experienced no significant difference in Length, and Wet Weight when compared to the Negative Control. Consequently, this test established a NOAEC of 0.037 mg a.i./L and LOAEC of >0.037 mg a.i./L (Geometric Mean-Measured concentration values) for Length, and Wet Weight. Moreover, for 28-day Survival, and Embryo Viability, all concentrations experienced some embryo and juvenile mortality, however these mortalities were considered non-dose-related. Thus, a NOAEC of 0.037 mg a.i./L and LOAEC of >0.037 mg a.i./L (Geometric Mean-Measured concentration values) were also established for these parameters. Also, *"Normally five concentrations of the test substance spaced by a constant factor not exceeding 3.2 are required."* Due to all endpoints being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 33-day Early-Life Stage flow-through test on Fathead Minnow (*Pimephales promelas*) (MRID # 49677748) was conducted on the XDE-848 acid degradant (X11438848) following EPA/OPPTS *Ecological Effect Test Guideline 850.1400 – Fish Early-Life Stage Toxicity Test.* All concentrations experienced no significant difference in <u>Length</u>, and <u>Wet Weight</u> when compared to the Negative Control. Consequently, this test established a non-definitive NOAEC of 29.8 mg/L and LOAEC of >29.8 mg/L (Geometric Mean-Measured concentration values) for Length, and Wet Weight. Moreover, for <u>28-day Survival</u>, and <u>Embryo Viability</u>, all concentrations experienced some embryo and juvenile mortality, however these mortalities were considered non-dose-related. Thus, a non-definitive NOAEC of 29.8 mg/L and LOAEC of >29.8 mg/L (Geometric Mean-Measured concentration values) were also established for these parameters. This study was conducted in a pH-range above the prescribed value range for that parameter. This study is classified as acceptable.

A definitive, 96-hr. acute static-renewal test on Common Carp (*Cyprinus carpio*) (MRID # 49677910) was conducted on Typical End-Use Product (TEP) GF-3206 (2.7% a.i., nominal) following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No mortalities were observed during this test, consequently non-definitive LC_{50} of >3.2 mg a.i./L and NOAEC of 3.2 mg a.i./L values (mean-measured concentration) were established. Sub-lethal effects (surfacing and/or lethargy) were observed in all fish in the 3.2 mg a.i./L group throughout the study. This study was conducted in a pH-range above the prescribed value range for that parameter. This study is classified as acceptable.

A definitive, 96-hr. acute static-renewal test on Common Carp (*Cyprinus carpio*) (MRID # 49678012) was conducted on Typical End-Use Product (TEP) GF-3301 (26.5% a.i., nominal) following EPA/OPPTS *Ecological Effect Test Guideline 850.1075 – Fish Acute Toxicity Test, Freshwater and Marine*. No mortalities or clinical signs of effect were observed during this test, consequently non-definitive LC_{50} of >0.526 mg a.i./L and NOAEC of >0.526 mg a.i./L were established. Sub-lethal effects (lethargy, difficulty maintaining equilibrium) were observed in the 0.222 mg a.i./L & 0.526 mg a.i./L groups. Water hardness values measured during this test were uncommonly high (231 mg/L). This study is classified as acceptable.

A.2. Aquatic Plant DER Summaries

A.2.1. Nonvascular Aquatic Plant Studies

A definitive 96-hour static acute test using cultures of marine diatom, *Skeletonema cosatum* (strain not reported) (MRID # 49677766), was conducted with florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity.* The test substance was unstable under test conditions, with 96-hour measured recoveries ranging from 2 to 41% of 0-hour concentrations, consequently toxicity values were based upon <u>initial measured concentrations</u>, which were <0.000228 (<MQL, negative and solvent controls), 0.00288, 0.00550, 0.0124, 0.0206, and 0.0389 mg ai/L.

Non-definitive IC_{50} values for Yield, Growth Rate, and AUC were >0.389 mg a.i./L, using initial measured concentrations. Furthermore, no treatment-related effects (NOAEC) was 0.0124 mg a.i./L for these metrics. The % growth inhibition of cell density in the treated algal culture as compared to the control ranged from 1 to 38%. There were no changes in pH during the test. Due to the non-definitive IC_{50} value being less than the EEC, this study is classified as supplemental.

A definitive 96-hour static acute test using cultures of freshwater diatom, *Navicula pelliculosa* (strain not reported) (MRID # 49677767), was conducted with florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity.* The test substance was unstable under test conditions, with 96-hour measured recoveries ranging from 34 to 68% of 0-hour concentrations, consequently toxicity values were based upon initial measured concentrations, which were <0.000228 (<MQL, negative and solvent controls), 0.00276, 0.00640, 0.0124, 0.0274, and 0.0565 mg a.i./L. Non-definitive IC_{50} values for Yield, Growth Rate, and AUC were >0.0565 mg a.i./L, using initial measured concentrations. The Yield, Growth Rate, and AUC, no treatment-related effects (NOAEC) was 0.0124 mg a.i./L. Statistically-significant effects on Growth Rate, Yield and AUC were established at and above the 0.0274 mg a.i./L level. The % growth inhibition of cell density in the treated algal culture, as compared to the control, ranged from 1 to 6%. There were increases in pH during the test. Due to the non-definitive IC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. static acute test using freshwater green algae, *Pseudokirchneriella subcapitata* (strain not reported) (MRID # 49677768) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity.* The test substance was unstable under test conditions, with 96-hour measured recoveries ranging from 55 to 67% of 0-hour concentrations, consequently toxicity values were based upon initial measured concentrations, yielding <0.000228 (<MQL, negative and solvent controls), 0.00326, 0.00730, 0.0145, 0.0298, and 0.0612 mg ai/L, sequentially. IC_{50} values for Yield, Growth Rate, and AUC were >0.0612 mg a.i./L. No treatment-related effects (NOAEC) were observed for Yield, Growth Rate, and AUC at or below 0.0612 mg a.i./L. The % growth inhibition of cell density in the treated algal culture, as compared to the control, ranged from -6 to 6%. There were slight increases in pH during the test. Due to the non-definitive IC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 96-hr. static test using freshwater green algae, *Pseudokirchneriella subcapitata* (strain not reported) (MRID # 49677769) was conducted on the XDE-848 acid degradant (X11438848) following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity.* Mean measured concentrations were <0.404 (<MQL, negative control), 6.61, 13.7, 25.6, 50.3, and

103 mg ai/L, respectively. Reviewer-calculated values (using linear regression on the highest two levels, which were the only levels that demonstrated effects - one below 50% and one above 50% as compared to the controls) were: Yield: IC_{50} = 75.26 mg/L, Growth Rate IC_{50} = 75.13 mg/L, Area Under the Curve (AUC) IC_{50} = 75.85 mg/L. All endpoints exhibited dose-dependent effects, with complete inhibition at the top treatment level. The % growth inhibition of cell density in the treated algal culture, as compared to the control, ranged from -6 to 100%. For Yield, Growth Rate, and AUC, no treatment-related effects (NOAEC) was established at 50.3 mg/L. There were increases in pH during the test for all test concentrations except the highest test concentration (nominal 100 mg/L), where there was a slight decrease in pH. This study is classified as acceptable.

A definitive, 96-hr. static acute test using freshwater diatom, *Navicula pelliculosa* (MRID # 49677770) was conducted on XDE-848 hydroxy acid (X11966341) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal* Toxicity. The test substance was unstable under test conditions, with 96-hour measured recoveries ranging from 30 to 48% of 0-hour concentrations, consequently toxicity values were based upon initial measured concentrations, yielding <0.022 (<MQL, negative control), 0.70, 1.5, 2.9, 5.7, and 11 mg a.i./L, sequentially. Non-definitive IC_{50} values for Yield, Growth Rate, and AUC were >11.0 mg/L. Statistically-significant inhibition was observed for Growth Rate, Area Under the Curve (AUC) and Yield at and above 2.9 mg/L. For Yield, Growth Rate, and AUC, treatment-related effects (NOAEC), was 1.5 mg/L. The percent growth-inhibition of cell density in the treated algal culture, as compared to the control, ranged from 5 to 41%. This study is classified as acceptable.

A definitive 96-hour static acute test using cultures of freshwater diatom, *Navicula pelliculosa* (strain not reported) (MRID #49677771), was conducted with the dechloro-XDE-848 acid (X12393505) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity.* The geometric mean-measured concentrations were 0.66, 1.4, 2.6, 5.0 and 9.9 mg ai/L. Non-definitive IC_{50} values for all metrics (Yield, Growth Rate, and AUC) were established at >9.9 mg /L. The Yield and Growth Rate, no treatment-related effects (NOAEC) was 9.9 mg/L. A statistically-significant effect on Area Under the Curve (AUC) occurred at 9.9 mg /L. No treatment-related effects (NOAEC) for AUC were observed at or below the 5 mg a.i./L level. The % growth inhibition of cell density in the treated algal culture, as compared to the control, ranged from -30 to 8%. There were slight increases in pH during the test. This study is classified as acceptable.

A definitive 96-hour static acute test using cultures of freshwater diatom, *Navicula pelliculosa* (strain not reported) (MRID # 49677772), was conducted with the nitro hydroxy acid (X12483137) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity.* The geometric mean-measured concentrations were 0.040, 0.052, 0.12, 0.30, and 1.4 mg a.i./L. IC_{50} values for Yield, Growth Rate, and AUC were 5.619, >9.500, and 6.897 mg/L level, respectively.

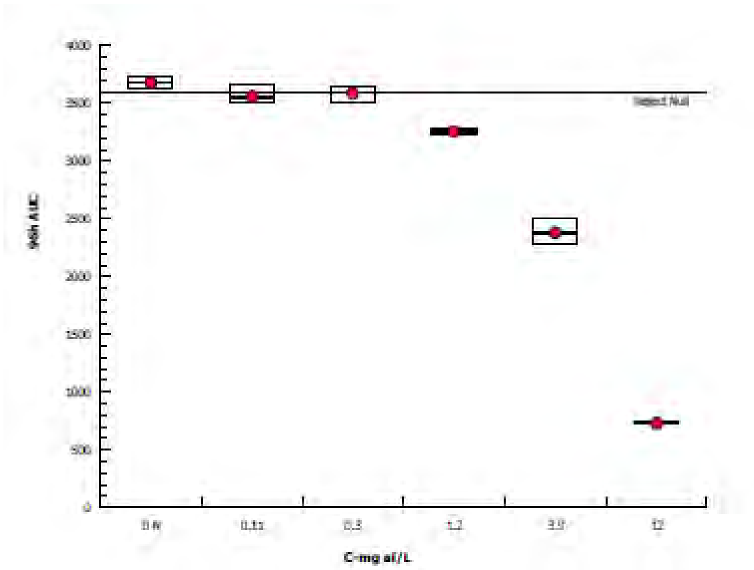
Statistically-significant effects on Growth Rate and Area Under the Curve occurred at and above 5.1 mg a.i./L. Statistically-significant effects on Yield occurred at and above 2.5 mg /L. Furthermore, for Growth Rate and Area Under the Curve, the NOAEC was 2.5 mg /L. The NOAEC for Yield was 1.4 mg/L. The % growth inhibition of cell density in the treated algal culture, as compared to the control, ranged from -1 to 74%. There were increases in pH during the test. This study is classified as acceptable.

A definitive, 96-hour static acute test using cultures of freshwater diatom, *Navicula pelliculosa* (strain not reported) (MRID # 49677773), was conducted with the des-chloro XDE-848 benzyl ester (X12131932) degradant following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity*. The geometric mean-measured concentrations were 0.046, 0.077, 0.090, 0.16, and 0.36 mg a.i./L. Non-definitive IC_{50} values for Yield, Growth Rate, and Area Under the Curve (AUC) were >1.3 mg/L. For all metrics, no statistically-significant effects were observed. Furthermore for Yield, Growth Rate and AUC, the NOAEC was 1.3 mg/L. The % growth inhibition of cell density in the treated algal culture, as compared to the control, ranged from -1 to 8%. There were increases in pH during the test. This study is classified as acceptable.

A definitive, 96-hour static acute toxicity test using freshwater cyanobacteria (blue-green algae), *Anabaena flos-aquae* (MRID # 49677774) was conducted using florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity*. The test substance was unstable under test conditions, with 96-hour measured recoveries ranging from 67 to 77% of 0-hour concentrations, consequently toxicity values were based upon <u>initial measured concentrations</u>, yielding <0.000228 (<MQL, negative and solvent controls), 0.00324, 0.00702, 0.0141, 0.0285, and 0.0513 mg a.i./L, sequentially. Non-definitive IC_{50} values for Yield, Growth Rate, and AUC were >0.0513 mg a.i./L. Statistically-significant effects on Growth Rate, Yield and Cell Density were observed at 0.0513 mg a.i./L. In the absence of additional data, these effects were considered dose-related. The NOAEC for Yield and Growth Rate was 0.0285 mg a.i./L (LOAEC of 0.0513 mg a.i./L). This study is classified as acceptable.

A definitive, 96-hour static acute toxicity test on freshwater green algae, *Pseudokirchneriella subcapitata* (MRID # 49677912) was conducted using Technical End-Use Product (TEP) GF-3206 following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity*. The test substance was unstable under test conditions, with 96-hour measured recoveries ranging from 21 to 57% of 0-hour concentrations. Consequently, toxicity values were based on <u>initial measured concentrations</u>, yielding <0.0017 (<MQL, negative control), 0.11, 0.30, 1.2, 3.9, and 12 mg a.i./L, sequentially. IC_{50} values for Yield, Growth Rate, and AUC were 4.658 mg a.i./L, >12 mg a.i./L and 5.582 mg a.i./L, respectively. For Under the Curve (AUC), all experimental groups experienced statistically-significant effects when compared to the control group. However, the reviewer's best professional judgment views the effect at 0.11 mg a.i./L as not significant and thus established the non-definitive NOAEC at 0.3 mg a.i./L for this metric. For Mean Yield, the

NOAEC was 0.110 mg a.i./L. For Growth Rate, the NOAEC was 0.300 mg a.i./L. The % growth inhibition of cell density in the treated algal culture as compared to the control ranged from 3 to 91%. There were increases in pH during the test. Finally, based on best-professional-judgment, the first treatment level is not statistically significantly-different than the control group (see graph below). Consequently, the third treatment level reestablishes the NOAEC at 0.3 mg a.i./L / 1.2 mg a.i./L LOAEC. This study is classified as acceptable.



A definitive, 96-hour static acute toxicity test on freshwater green algae, *Pseudokirchneriella subcapitata* (MRID #49678013) was conducted using florpyrauxifen Typical End-Use Product (TEP) GF-3301 following EPA/OPPTS *Ecological Effect Test Guideline 850.4500 – Algal Toxicity*. The test substance was unstable under test conditions, with 96-hour measured recoveries ranging from 65 to 83% of 0-hour concentrations. Consequently, toxicity values were based on initial measured concentrations, yielding <0.00866 (<MQL, negative control), 0.123, 0.290, 0.499, 1.02, and 2.12 mg a.i./L, sequentially. Non-definitive IC_{50} values for Yield, Growth Rate, and AUC were >2.12 mg a.i./L. Statistically-significant inhibition was observed at the 1.02 mg a.i./L level for Growth Rate, Area Under the Curve (AUC) and Yield. The NOAEC was 0.499 mg a.i./L for all three parameters. The % growth inhibition of cell density in the treated algal culture as compared to the control ranged from 0 to 32%. There were increases in pH during the test. This study is classified as acceptable.

A.2.2. Vascular Aquatic Plant Studies

A definitive, 7-day acute static-renewal test using Duckweed (*Lemna gibba*) (MRID # 49677765) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.4400 – Aquatic Plant Toxicity Test using Lemna sp*. All concentrations experienced <u><</u>50% inhibition for all endpoints (frond number yield, frond number growth rate, final biomass, and biomass growth rate), consequently this test established a non-definitive IC_{50} of >0.0414 mg a.i./L, using time-weighted average concentrations (TWA). The NOAEC for all endpoints was also 0.0414 mg a.i./L. Growth (frond number) inhibition across all levels ranged from 3 to -12 percent. Final biomass inhibition across all levels, as compared to the control, ranged from 3 to -7 percent. After 7 days, necrotic fronds were observed in the negative and solvent controls and all treatment groups except 0.00586 mg a.i./L (geometric mean measured concentration). Chlorotic fronds were observed in the geometric mean measured concentrations of 0.0242 and 0.0461 mg a.i./L treatment groups. There were no compound-related phytotoxic effects. There was an increase in pH during the test. Due to the non-definitive IC_{50} value being less than the EEC, this study is classified as supplemental (quantitative).

A definitive, 7-day acute static-renewal test using Duckweed (*Lemna gibba*) (MRID # 49677911) was conducted on florpyrauxifen-benzyl Typical End-Use Product (TEP) GF-3206 following EPA/OPPTS *Ecological Effect Test Guideline 850.4400 – Aquatic Plant Toxicity Test using Lemna sp*. The testing established a definitive IC_{50} for Frond Number Yield, the most sensitive metric, of 26.27 mg a.i./L using time weighted average (TWA) concentrations. Testing also established a NOAEC of 5.9 mg a.i./L for Frond Number, Frond Number Yield, Frond Number Growth Rate, Biomass Yield and Biomass Growth Rate. The % growth inhibition of frond number in the treated culture as compared to the control ranged was -4 to 71%. This study is classified as acceptable.

Eleven studies using florpyrauxifen-benzyl (3) and transformation products (8) on submerged aquatic vegetation (SAVs) were conducted using OECD guidelines. Seven of these studies were conducted on Eurasian watermilfoil (*Myriophyllum spicatum*), two were conducted on Coontail (*Ceratophyllum demersum*) and two were conducted on Carolina Fanwort (*Cabomba caroliniana*). Two studies using Myriophyllum (MRID# 49677805, 49677806) have been reviewed, while the other studies are currently under review.

In a 14-day acute toxicity study (MRID# 49677805) using OECD Guideline 239 draft AMRAP Method: *Growth Inhibition Test for Rooted Aquatic Macrophyte* (July 22, 2013)., the freshwater rooted macrophyte (*Myriophyllum spicatum*) were exposed to florpyrauxifen-benzyl at nominal concentrations of 0 (negative and solvent controls), 2.98, 9.54, 30.5, 97.7, 313, and 1000 ng/L under static conditions. Mean measured florpyrauxifen-benzyl concentrations were <2.00 (<LOQ; controls), 1.78, 4.83, 13.0, 38.6, 131, and 391 ng a.i./L, and geometric mean-measured concentrations were 1.60, 2.94, 5.00, 12.7, 41.0, and 137 ng a.i./L. The mean-measured concentrations of the XDE-848 acid degradate were <2.00 (<LOQ; controls), 1.00, 2.66, 6.50, 17.3, 64.5, and 178 ng a.i./L, and geometric mean-measured concentrations were 1.00, 2.08, 3.46, 5.80, 11.3, and 18.8 ng a.i./L. The IC_{50} and NOAEC for shoot length yield, the most sensitive endpoint, were 16.2 and 4.83 ng a.i./L, respectively, based on the mean-measured active ingredient concentrations. The % growth inhibition of length in the treated culture as compared to the control ranged was -9 to 80%.

After 14 days, no effects were observed in the negative and solvent controls and the two lowest treatment groups. In the four highest concentrations, hanging leaves and deformed shoots were observed along with a shorter and a reduced number of roots. There was an increase in pH during the test.

Alternate Interpretation
Data for both florpyrauxifen-benzyl and XDE-848 acid were available for this study, and due to transformation of the TGAI in to the acid (and other products) during the study period, combined-stressor NOAEC and LC_{50} values was also calculated. In this approach, combined-stressor values were calculated as the sum of the TGAI mass' endpoint value plus the acid mass' endpoint value, which was previously converted to TGAI mass-equivalents by multiplying the acid mass' value by the ratio of the TGAI molecular weight / the Acid molecular weight. Then, these new values were reported alongside the original florpyrauxifen-only values (Table A.2).

Table A.2. Most-sensitive endpoint data for Myriophyllum, including Combined Stressor values

	Mean-Measured Active Ingredient (ng a.i./L)	Mean-Measured Acid (ng a.i./L)	Combined Stressor (ng a.i./L)
Shoot Length Yield	IC_{50}: 16.2 (11.0-23.9) NOAEC: 4.83 LOAEC: 13.0	IC_{50}: 8.13 (5.57-11.9) NOAEC: 2.66 LOAEC: 6.50	IC_{50}: 26.43 NOAEC: 8.18 LOAEC: 21.18
Shoot Length Growth Rate	IC_{50}: 54.6 (41.2-72.4) NOAEC: 4.83 LOAEC: 13.0	IC_{50}: 26.5 (20.-35.1) NOAEC: 2.66 LOAEC: 6.50	IC50: 87.94 NOAEC: 8.18 LOAEC: 21.18
Fresh Weight Yield	IC_{50}: 17.1 (11.2-26.0) NOAEC: 4.83 LOAEC: 13.0	IC_{50}: 8.57 (5.68-12.9) NOAEC: 2.66 LOAEC: 6.50	IC50: 27.88 NOAEC: 8.18 LOAEC: 21.18
Fresh Weight Growth Rate	IC_{50}: 49.5 (36.6-66.8) NOAEC: 4.83 LOAEC: 13.0	IC_{50}: 24.1 (17.9-32.4) NOAEC: 2.66 LOAEC: 6.50	IC_{50}: 79.82 NOAEC: 8.18 LOAEC: 21.18
Dry Weight Yield	IC_{50}: 50.8 (29.5-87.4) NOAEC: 4.83 LOAEC: 13.0	IC_{50}: 24.7 (14.5-42.1) NOAEC: 2.66 LOAEC: 6.50	IC_{50}: 81.88 NOAEC: 8.18 LOAEC: 21.18
Dry Weight Growth Rate	IC_{50}: 102 (63.6-162) NOAEC: 4.83 LOAEC: 13.0	IC_{50}: 48.5 (30.6-76.9) NOAEC: 2.66 LOAEC: 6.50	IC_{50}: 163.02 NOAEC: 8.18 LOAEC: 21.18

In a 14-day acute toxicity study (MRID# 49677806), using OECD draft AMRAP Method: *Growth Inhibition Test for Rooted Aquatic Macrophyte* (July 22, 2013), the freshwater rooted Macrophyte (*Myriophyllum spicatum*) were exposed to the degradate of florpyrauxifen-benzyl, XDE-848 acid, at nominal concentrations of 0 (negative and solvent controls), 0.0447, 0.143, 0.458, 1.46, 4.69, and 15.0 µg a.i./L under static conditions. Mean-measured concentrations were <0.0150 (<LOQ, negative and solvent controls), 0.0381, 0.115, 0.368, 1.19, 4.17, and 15.6 µg ai/L. The NOAEC and IC_{50} values for shoot length yield, the most sensitive endpoint, were 0.115 and 0.497 µg a.i./L, respectively. The % growth inhibition of length in the treated culture as compared to the control ranged was -24 to 72%. After 14 days, no effects were observed in the negative and solvent controls and the lowest treatment group. In the nominal 0.000143ug ai/L treatment group there were hanging leaves and deformed shoots. In the four highest concentrations, hanging leaves and deformed shoots were observed along with a shorter and a reduced number of roots. There was an increase in pH during the test.

MRID# 49677807: Des-chloro XDE-848 acid (X12393505): Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System - System – Under Review

MRID# 49677808: Des-chloro XDE-848 benzyl ester (X12131932): Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System - System – Under Review

MRID# 49677809: X11438848 (XDE-848 acid): Growth Inhibition of *Cabomba caroliniana* in a Water/Sediment System – Under Review

MRID# 49677810: XDE-848 Benzyl Ester: Growth Inhibition of *Cabomba caroliniana* in a Water/Sediment System – Under Review

MRID# 49677811: XDE-848 hydroxy acid (X11966341): Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System – Under Review

MRID# 49677812: XDE-848 hydroxy benzyl ester (X12300837): Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System – Under Review

MRID# 49677813: Nitro hydroxy acid (X12483137): Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System – Under Review

MRID# 49677814: X11438848 (XDE-848 acid): Growth Inhibition of *Ceratophyllum demersum* in a Water/Sediment System – Under Review

MRID# 49677815: XDE-848 Benzyl Ester: Growth Inhibition of *Ceratophyllum demersum* in a Water/Sediment System – Under Review

A.3. Terrestrial Animal DER Summaries

A.3.1. Bird Studies

A 14-day acute-oral limit test using Bobwhite quail (*Colinus virginianus*) (MRID # 49677751) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.2100 – Avian Acute Oral Toxicity Test*. The testing established a non-definitive LD_{50} of >2,250 mg a.i./kg. No statistically-significant treatment-related effects were observed for Body Weight or for Food Consumption at the 2,250 mg a.i./kg level as compared to the negative control group. Necropsies were not performed. This study is classified as acceptable.

A 14-day acute-oral limit test using Zebra finches (*Taeniopygia guttata*) (MRID # 49677752) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.2100 – Avian Acute Oral Toxicity Test*. The testing established a non-definitive LD_{50} of >2,250 mg a.i./kg. No statistically-significant treatment-related effects were observed for Body Weight or for Food Consumption at the 2,250 mg a.i./kg level, when compared to the negative control group. The laboratory reduced the time of withholding food prior to the initiation of the study (presumably to reduce the opportunity for rejection of the gelatin capsule). No notable necropsy findings were observed. This study is classified as acceptable.

A definitive, 8-day acute-diet test using Bobwhite quail (*Colinus virginianus*) (MRID # 49677753) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.2200 – Avian Dietary Toxicity Test*. All concentrations experienced ≤50% mortality, consequently this test established a non-definitive LC_{50} of >5,640 mg a.i./kg (diet). One mortality at the 557 mg a.i./kg (diet) level was observed, but this mortality was considered non-dose-related. One statistically-significant treatment-related effect (weight gain) was observed at the 557 mg a.i./kg (diet) level, but this effect was considered non-toxic. No other statistically-significant treatment-related effects were observed for body weight, body weight change, or feed consumption at or below the 5,640 mg a.i./kg (diet) level. 12 day-old chicks were used in this study, which is slightly older than the prescribed range for this parameter. This study is classified as acceptable.

A definitive, 8-day acute-diet test using Mallard ducks (*Anas platyrhynchos*) (MRID # 49677754) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.2200 – Avian Dietary Toxicity Test*. No mortalities were observed during the test period, consequently this test established a non-definitive LC_{50} of ≥5,640 mg a.i./kg (diet). No statistically-significant treatment-related effects were observed for body weight, body weight change, or feed consumption at or below the 5,640 mg a.i./kg (diet) level. 5 day-old chicks were used in this study, which is significantly younger than the prescribed range for this parameter. This study is classified as acceptable.

A definitive, one-generation reproductive-effects test using Bobwhite quail (*Colinus virginianus*) (MRID # 49677755) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.2300 – Avian Reproduction Test*. The testing established a non-definitive LOAEC of >999 mg a.i./kg and a NOAEC of 999 mg a.i./kg for the following endpoints: Number of Laying Pairs, Number of Eggs Laid, Number of Cracked Eggs, Number of Eggs Set, Number of Viable Embryos, Number of Live 3-week old Embryos, Number of Hatchlings, Number of 14-day old Hatchling Survivors, Number of Eggs Laid per Hen, Number of Eggs Laid per Hen per Day (91 days), 14-day old Survivors per Hen, Percent Eggs Laid per Maximum Eggs Laid, Percent Cracked Eggs per Eggs Laid, Percent Viable Embryos per Eggs Set, Percent Live 3-week old Embryos per Viable Embryos, Percent Hatchlings per Live 3-week old Embryos, Percent 14-day old Survivors per Hatchlings, Percent Hatchlings per Eggs Set, Percent 14-day old Survivors per Eggs Set, Percent Hatchlings per Maximum Eggs Set, Percent 14-day old Survivors per Maximum Eggs Set, Shell Thickness, Hatchling Weight, 14-day old Survivor's Weight, Mean Food Consumption, Weight of Female Parents (at Test Initiation, at week 4 and at Test Termination), Weight of Male Parents (at Test Initiation, at week 4 and at Test Termination). Mean Food Consumption was statistically significantly-reduced at the highest test-level, but this reduction in consumption did not produce a statically significant-reduction in Mean Adult Body Weight in either male or female birds during the test period. Consequently, for Mean Food Consumption, a LOAEC of 999 mg a.i./kg and a NOAEC of 398 mg a.i./kg was established. Finally, there was a slight, non-statically-significant reduction in shell thickness at the 398 mg a.i./kg level. This study is classified as acceptable.

A definitive, one-generation reproductive-effects test using Mallard ducks (*Anas platyrhynchos*) (MRID # 49677756) was conducted on florpyrauxifen-benzyl following EPA/OPPTS *Ecological Effect Test Guideline 850.2300 – Avian Reproduction Test*. The testing established a non-definitive LOAEC of >999 mg a.i./kg and a NOAEC of 999 mg a.i./kg for the following endpoints: Number of Laying Pairs, Number of Eggs Laid, Number of Cracked Eggs, Number of Eggs Set, Number of Viable Embryos, Number of Live 3-week old Embryos, Number of Hatchlings, Number of 14-day old Hatchling Survivors, Number of Eggs Laid per Hen, Number of Eggs Laid per Hen per Day (91 days), 14-day old Survivors per Hen, Percent Eggs Laid per Maximum Eggs Laid, Percent Cracked Eggs per Eggs Laid, Percent Viable Embryos per Eggs Set, Percent Live 3-week old Embryos per Viable Embryos, Percent Hatchlings per Live 3-week old Embryos, Percent 14-day old Survivors per Hatchlings, Percent Hatchlings per Eggs Set, Percent 14-day old Survivors per Eggs Set, Percent Hatchlings per Maximum Eggs Set, Percent 14-day old Survivors per Maximum Eggs Set, Shell Thickness, Hatchling Weight, 14-day old Survivor's Weight, Mean Food Consumption, Weight of Female Parents (at Test Initiation, at week 4 and at Test Termination), Weight of Male Parents (at Test Initiation, at week 4 and at Test Termination). No mortalities or treatment-related signs of toxicity were observed in the control or treatment groups. This study is classified as acceptable.

A.3.2. Bee Studies

48-hr. acute-oral & acute-contact limit tests using Honey Bees (*Apis mellifera* L.) (MRID # 49677757) were conducted on florpyrauxifen-benzyl following guidelines outlined in OECD 213, OECD *Guideline for the Testing of Chemicals on Honeybee, Acute Oral Toxicity Test*; and OECD

214, OECD *Guideline for the Testing of Chemicals on Honeybee, Acute Contact Toxicity Test*. This limit, oral testing established a non-definitive LC_{50} of >0.1054 mg a.i./bee. After 48 hours 4% mortality (2/50) was observed, and in the absence of other data, these mortalities were considered dose-related. 98% mortality was observed with 0.00032 mg a.i./bee of *Dimethoate* (as a positive control) during the testing.

The contact testing produced non-definitive LD_{50} of >0.100 mg a.i./bee. No mortality (0/50) was observed. Two bees in the treatment group (4 percent) were observed to have sub-lethal effects (apathy, coordination problems) due to the dosing. 78% mortality was observed with 0.00030 mg a.i./bee of *Dimethoate* (as a positive control) during the testing. This study is classified as acceptable.

A.3.3. Mammal Studies

Studies submitted on the effects of florpyrauxifen-benzyl to mammals was reviewed by the Health Effects Division of EFED/OCSPP/OPP. Consequently, those reviews are not summarized here.

A.4. Terrestrial Plant Studies

Emergence

A definitive, 21-day seedling emergence and growth test (MRID # 49677759) using monocots (Corn, Onion, Oat and Ryegrass) and dicots (Cucumber, Carrot, Oilseed Rape, Soybean, Sugarbeet and Sunflower) was conducted with Typical End-Use Product (TEP) GF-3206 following EPA/OPPTS *Ecological Effect Test Guideline 850.4100 – Seedling Emergence and Seedling Growth*.

The most sensitive monocot was onion (based on dry weight), with NOAEC and IC_{25} values of 0.0034 and 0.00617 lb. a.i./A, respectively; the most sensitive dicot was carrot (based on survival), with EC_{25} values of 0.002541 lb. a.i./A and a EC_{05} of 0.0002648 lb. a.i./A. Because survival was the most sensitive endpoint for carrot, linear regression using ICp (CETIS V.1.9.2) was used for the calculations.

Seedling emergence in the negative control ranged from 83 to 100%. Significant inhibitions in seedling emergence were observed in carrot (up to 97%), onion (up to 20%), corn and cucumber (both 12%, but not dose-related). Significant inhibitions in survival were observed in carrot (up to 97%), onion (up to 23%), corn (3%, but not dose-related). Significant inhibitions in dry weight were observed in carrot (up to 87%), onion (up to 86%), oilseed rape (up to 60%), and soybean (up to 24%). Finally, significant inhibitions in seedling height were found in carrot (up to 61%), onion (up to 46%) and oilseed rape (up to 18%).

There were none-to-slight phytotoxic effects (≤30) for corn, cucumber, oat, ryegrass, soybean and sugar beet; moderate effects in oilseed rape and sunflower; and severe effects in carrot and onion. The visual response score of 0 indicated normal seedlings and 100 indicated complete mortality. Maximum effects were 30 for cucumber and soybean, 40 for oilseed rape and sunflower, 80 for onion, and 100 for carrot. Effects were dose-related.

One replicate for corn at 0.010 lb. a.i./A and two replicates for sugar beet at 0.00054 and 0.026 lb. a.i./A were not planted in oversight. Corn and sugar beet did not have the OCSPP recommended number of 40 seedlings per treatment level (6) "*For each species, the minimum number of test organisms is 40 seeds per dose level (a minimum of four replicates, each replicate with a minimum of 10 seeds*)". Due to the missing replicates, this study is classified as supplemental.

A definitive, 21-day seedling emergence, seedling growth test using monocots (Corn, Onion, Oat and Ryegrass) and dicots (Cucumber, Carrot, Oilseed Rape, Soybean, Sugarbeet and Sunflower) (MRID # 49677760) was conducted using the XDE-848 acid degradant (X11438848) following EPA/OPPTS *Ecological Effect Test Guideline 850.4100 – Seedling Emergence and Seedling Growth*. The study included a water control and a vehicle control for the acetone (20% v/v) solvent. For all endpoints (emergence, survival, height and dry weight), there were no significant differences between the negative water control and the solvent control. Inhibitions were calculated from the negative water control.

The most sensitive monocot was onion (based on survival), with an EC_{25} value of 0.01294 lb. a.i./A, and a EC_{05} value of 0.0002214 lb. a.i./A. The most sensitive dicot was carrot (based on survival), with an EC_{25} value of 0.0009306 lb. a.i./A, and a EC_{05} value of 0.0000247 lb. a.i./A. Because survival was the most sensitive endpoint for carrot and onion, linear regression using ICp (CETIS V.1.9.2) was used for the calculations.

Significant inhibitions in emergence were observed in carrot (up to 67%) and onion (up to 85%), compared to the negative control (seedling emergence in the negative control ranged from 71 to 100%). Significant inhibitions in survival were observed in carrot (up to 100%), cucumber (up to 20%), oilseed rape (37%), onion (up to 85%) and soybean (55%) (survival in the negative control ranged from 71 to 100%). Significant inhibitions in seedling dry weight were observed in cucumber (up to 39%), oilseed rape (up to 46%), onion (up to 64%), ryegrass (up to 56%), sugar beet (up to 53%), and sunflower (up to 37%). Significant inhibitions in seedling height were found in carrot (up to 54%), oilseed rape (up to 28%), ryegrass (up to 44%), soybean (up to 34%), sugar beet (up to 31%), and sunflower (up to 21%).

There were none-to-slight phytotoxic effects (≤30) for corn and oat; moderate effects (40-60) in cucumber and sugar beet and severe to complete effects (70-100) in carrot, oilseed rape, onion, ryegrass, soybean and sunflower. Phytotoxic effects were dose-related. This study is classified as Acceptable.

A definitive, 21-day seedling emergence, seedling growth test (MRID # 49677761) using dicots (Cucumber, Carrot, Oilseed Rape, Soybean, Sugarbeet and Sunflower) was conducted using XDE-848 hydroxy benzyl ester (X12300837), XDE-848 hydroxy acid (X11966341), des-chloro XDE-848 benzyl ester (X12131932), des-chloro XDE-848 acid (X12393505), and nitro hydroxy acid (X12483137) metabolites following EPA/OPPTS *Ecological Effect Test Guideline 850.4100 – Seedling Emergence and Seedling Growth*. No monocots were used in the study. Measured concentrations were 0.090 lb. a.i./A for plants treated with X12300837, 0.082 lb. a.i./A for X11966341; 0.089 lb. a.i./A for X12483137; 0.056 lb. a.i./A for X12131932 and 0.047 lb. a.i./A for X12393505.

The study included a water control and a vehicle control for the acetone/DMSO solvent (97:3 at 0.17% v/v in water). For all metabolites and all endpoints (emergence, survival, height and dry weight), there were no significant differences between the negative water control and the solvent control. Inhibitions were calculated from the negative water control.

For XDE-848 benzyl hydroxy (X12300837), the emergence in the negative control ranged from 98 to 100%, and no significant inhibitions of emergence were observed. Survival in the negative control ranged from 98-100%, and no significant inhibitions of survival were observed. A significant decrease in soybean dry weight (inhibition up to 10% inhibition), with no significant inhibitions in height observed. The IC_{25} was >0.090 lbs. a.i./A, and the NOAEC was 0.090 lbs. a.i./A. Due to lack of toxicity, the most sensitive dicot could not be determined. Moreover, no phytotoxic effects were observed (for all species).

For XDE-848 hydroxy acid (X11966341), the emergence in the negative control ranged from 98 to 100%, and no significant inhibitions of emergence were observed. Survival in the negative control ranged from 98-100%, and no significant inhibitions of survival were observed. A significant decrease in soybean dry weight (up to 18% inhibition) was observed. A significant decrease in cucumber height (up to 14% inhibition). Carrot was the most sensitive dicot (based on survival, with NOAEC and EC_{25} values of 0.082 and 0.0688 lb/A, respectively). Other than the inhibition of carrots, no phytotoxic effects were observed.

For dechloro XDE-848 benzyl ester (X12131932), the emergence in the negative control ranged from 98 to 100%, and no significant inhibitions of emergence were observed. Survival in the negative control ranged from 98-100%, with no significant inhibitions of survival were observed. A significant decrease in cucumber dry weight (up to 13% inhibition) was observed. No significant inhibition of plant height was observed (for all species). The IC_{25} was >0.056 lbs. a.i./A, and the

NOAEC was 0.056 lbs. a.i./A. Due to lack of toxicity, the most sensitive dicot could not be determined. Moreover, no phytotoxic effects were observed (for all species).

For dechloro XDE-848 acid (X12393505), the emergence in the negative control ranged from 98 to 100%, and no significant inhibitions of emergence were observed. Survival in the negative control ranged from 98-100%, with no significant inhibitions of survival were observed. No significant decrease in dry weight was observed (all species). A significant inhibition of plant height in sunflowers (up to 12%) was observed. The IC_{25} was >0.047 lbs. a.i./A, and the NOAEC was 0.047 lbs. a.i./A. Due to lack of toxicity, the most sensitive dicot could not be determined. Moreover, no phytotoxic effects were observed (for all species).

For nitro hydroxy acid (X12483137), the emergence in the negative control ranged from 98 to 100%, and no significant inhibitions of emergence were observed. Survival in the negative control ranged from 98-100%, with no significant inhibitions of survival were observed. No significant decrease in dry weight was observed (all species). A significant decrease in cucumber plant height (up to 12% inhibition) was observed. The IC_{25} was >0.089 lbs. a.i./A, and the NOAEC was 0.089 lbs. a.i./A. Due to lack of toxicity, the most sensitive dicot could not be determined. Moreover, no phytotoxic effects were observed (for all species).

Guidance for the study specifies "*Four species of at least two families, one species of which is corn (Zea mays)*". Due to the missing required test species (monocots), this study is classified as supplemental.

Vegetative Vigor

A definitive, 21-day vegetative vigor test (MRID # 49677762) using monocots (Corn, Onion, Oat and Ryegrass) and dicots (Cucumber, Carrot, Oilseed Rape, Soybean, Sugarbeet and Sunflower) was conducted using florpyrauxifen Technical End-Use Product (TEP) GF-3206 following EPA/OPPTS Ecological Effect Test Guideline 850.4150 – *Vegetative Vigor*. Measured concentrations were determined for the three highest concentrations.

The most sensitive monocot was onion (based on dry weight), with NOAEC and IC_{25} values of 0.0034 and 0.00415 lb. a.i./A, respectively; the most sensitive dicot was soybean (based on dry weight), with NOAEC and IC_{25} values of 0.000014 and 0.0000469 lb. a.i./A, respectively.

Significant inhibitions in soybean (up to 100% - at the 0.011 lb. a.i./A treatment) and in carrot survival (27% at the 0.0034 lb. a.i./A) were observed. Survival in the negative control was 100% for all species.

Significant inhibitions in seedling dry weight was observed in carrot (up to 88%), in cucumber (up to 65%), in oilseed rape (up to 78%), in ryegrass (up to 43%) in soybean (up to 76% - there was

100% mortality at the 9.6 g a.s./ha treatment level), and in sunflower, (up to 86%), in onion (up to 81%), in sugar beet (up to 76%), and in corn (up to 63%), as compared to the control group.

Significant decreases in seedling height were observed in in carrot (up to 36%), cucumber (up to 68%) in oilseed rape (up to 33%), in soybean (up to 66% % - there was 100% mortality at the 9.6 g a.s./ha treatment level), and in sunflower, (up to 71%), in onion (up to 26%), in sugar beet (up to 33%), and in corn (up to 47%), as compared to the control group.

There were none-to-slight phytotoxic effects (≤30) in oat and ryegrass; moderate phytotoxic effects (30-60) in corn, cucumber and oilseed rape; severe to total phytotoxic effects in carrot, onion, soybean, sugar beet and sunflower. The visual response score of 0 indicated normal seedlings and 100 indicated complete mortality. These effects were dose-related. Because a NOAEC was not established for ryegrass, this study is classified as supplemental- quantitative.

A definitive, 21-day vegetative vigor test (MRID # 49677763) using monocots (Corn, Onion, Oat and Ryegrass) and dicots (Cucumber, Carrot, Oilseed Rape, Soybean, Sugarbeet and Sunflower) was conducted using the XDE-848 acid degradant (X11438848) following EPA/OPPTS Ecological Effect Test Guideline 850.4150 – *Vegetative Vigor*. Measured concentrations were determined for the three highest concentrations.

The study included a water control and a vehicle control of acetone (20% v/v). There were significant differences between the negative water control and the solvent control for carrot and sugar beet dry. No other species or endpoints showed significant differences between the water control and the vehicle control. Inhibitions were calculated from the negative water control.

The most sensitive monocot was onion (based on dry weight), with NOAEC and IC_{25} values of 0.023 and 0.0364 lb. a.i./A, respectively; the most sensitive dicot was soybean (based on dry weight), with NOAEC and IC_{25} values of 0.00022 and 0.000389 lb. a.i./A, respectively.

Significant inhibitions survival were found in carrot only; significant inhibitions were 27% at the 0.0034 lb. a.i./A treatment compared to the negative control. Survival in the negative control and treatment group was 100% for all species.

Significant inhibitions in seedling dry weight was observed in for all species except corn, oat and ryegrass. Significant inhibitions in seedling dry weight was observed in carrot (up to 75%), in oilseed rape (up to 45%), in onion (39%), in soybean (up to 78%), in Sugarbeet (up to 53%), in cucumber (up to 50%), and in sunflower (41%).

There were significant inhibitions in seedling height for all species except corn, oat, onion, sugar beet and ryegrass. Significant inhibitions in seedling dry weight was observed in carrot (17%), in cucumber (up to 60%), in soybean (up to 68%), in sunflower (34%), and in oilseed rape (up to 31%).

Based on visual observation, there were none-to-slight phytotoxic effects (≤30) for corn, oat and ryegrass; moderate effects (30-60) in cucumber, onion, oilseed rape, sugar beet and sunflower; and severe to total effects in carrot and soybean. The visual response score of 0 indicated normal seedlings and 100 indicated complete mortality. These effects were dose-related. This study is classified as Acceptable.

A definitive, 21-day vegetative vigor test using dicots (Cucumber, Carrot, Soybean, Sunflower and Cotton) (MRID # 49677764) was conducted using XDE-848 hydroxy benzyl ester (X12300837), XDE-848 hydroxy acid (X11966341), des-chloro XDE-848 benzyl ester (X12131932), des-chloro XDE-848 acid (X12393505), and nitro hydroxy acid (X12483137) metabolites following EPA/OPPTS *Ecological Effect Test Guideline*, 850.4150 – *Vegetative Vigor*. No monocots were used in the study.

Measured concentrations were 0.090 lb. a.i./A for plants treated with X12300837, 0.082 lb. a.i./A for X11966341; 0.089 lb. a.i./A for X12483137; 0.056 lb. a.i./A for X12131932 and 0.047 lb. a.i./A for X12393505.

The study included a water control and a vehicle control for the acetone/DMSO solvent (97:3 at 0.17% v/v in water). For all metabolites and all endpoints (emergence, survival, height and dry weight), there were no significant differences between the negative water control and the solvent control. Inhibitions were calculated from the negative water control.

For XDE-848 benzyl hydroxy (X12300837), survival in the negative control and treatment groups was 100% for all species. No significant decreases in dry weight were observed (for all species). There were no phytotoxic effects observed (for all species). For all species, the IC_{25} was >0.090 lbs. a.i./A, and the NOAEC was 0.090 lbs. a.i./A. The most sensitive dicot could not be determined due to lack of toxicity.

For XDE-848 hydroxy acid (X11966341), survival in the negative control and treatment groups was 100% for all species. Significant decrease in soybean dry weight (up to 29%) was observed. Significant decreases in soybean plant height (up to 26%), and in sunflower plant height (up to 15%) were observed. For the most sensitive species, soybean, the IC_{25} was 0.0723 lbs. a.i./A, and the NOAEC was 0.022 lbs. a.i./A. Phytotoxic effects observed for soybean (maximum effects were 17), based on visual observation. There were no other phytotoxic effects observed (for all species).

For dechloro XDE-848 benzyl ester (X12131932), survival in the negative control and treatment groups was 100% for all species. A significant decrease in sunflower dry weight, inhibition (11%) was observed. No significant decreases in plant height were observed. For all species, the IC_{25} was >0.056 lbs. a.i./A, and the NOAEC was 0.056 lbs. a.i./A. There were no phytotoxic effects observed (for all species). Due to the lack of toxicity, the most sensitive dicot could not be determined.

For deschloro XDE-848 acid (X12393505), survival in the negative control and treatment groups was 100% for all species. Significant decreases in dry weight in carrot (up to 17%), soybean (25%, which appeared to be non-dose related), and sunflower (10%, which appeared to be non-dose related) were observed. A significant decrease in sunflower plant height (20%, which did not appear to be dose-related) was observed. There were no phytotoxic effects observed (for all species). For all species, the IC_{25} was >0.047 lbs. a.i./A, and the NOAEC was 0.047 lbs. a.i./A. Due to the lack of toxicity, the most sensitive dicot could not be determined.

For nitro hydroxy acid (X12483137), survival in the negative control and treatment groups was 100% for all species. Significant decreases in sunflower dry weight (up to 11%) were observed. No significant decreases in plant height were observed. For all species, the IC_{25} was >0.089 lbs. a.i./A, and the NOAEC was 0.089 lbs. a.i./A. Due to the lack of toxicity, the most sensitive dicot could not be determined.

Guidance for the study specifies "*Four species of at least two families, one species of which is corn (Zea mays)*". Due to the missing required test species (monocots), this study is classified as supplemental.

Appendix B. Ecological Effects Data Tables

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
Freshwater Invertebrates	Acute	TGAI	Midge (*Chironomus riparius*) 850.1010	*Mortality* *LC_{50} >0.0563 mg a.i./L*	49677724 *(Acceptable)*	NA
			Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} >0.0626 mg a.i./L*	49677725 *(Acceptable)*	NA
			Scud (*Gammarus pseudolimnaeus)* 850.1020	*Mortality* *LC50 >0.0419 mg a.i./L*	49677731 *(Acceptable)*	NA
			Great Pond Snail (*Lymnaea stagnali*) 850.1020	*Mortality* *LC_{50} >0.0482 mg a.i./L*	49677732 *(Acceptable)*	NA
		TEP GF-3206	Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} = 1.32 mg a.i./L*	49677909 *(Acceptable)*	***Moderately Toxic***
		TEP GF-3301	Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} >22.2 mg a.i./L*	49678009 *(Acceptable)*	NA
		Acid X11438848	Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} >91.8 mg/L* *(115 mg p.e./L)*	49677726 *(Acceptable)*	NA
		Hydroxy Acid X11966341	Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} >100 mg/L* *(131 mg p.e./L)*	49677727 *(Acceptable)*	Practically Non-toxic

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		Des-Chloro-Acid X12393505	Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} >110 mg/L* *(153 mg p.e./L)*	49677728 *(Acceptable)*	Practically Non-toxic
		Des-chloro BE Ester X12131932	Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} >0.98 mg /L* *(1.06 mg p.e./L)*	49677729 *(Acceptable)*	NA
		Nitro-Hydroxy Acid X12483137	Water flea (*Daphnia magna*) 850.1010	*Mortality* *EC_{50} >10 mg/L* *(12 mg p.e./L)*	49677730 *(Acceptable)*	NA
	Chronic	TGAI	Water flea (*Daphnia magna*) 850.1300	*All*[1] *NOAEC: 0.0385 mg a.i./L* *LOAEC >0.0385 mg a.i./L*	496777744 *(Acceptable)*	NA
		Acid X11438848	Water flea (*Daphnia magna*) 850.1300	*Reproduction* *NOAEC: 25.9 mg/L* *(32.6 mg p.e./L)* *LOAEC: 52.9 mg/L* *(66.6 mg p.e./L)*	49677745 *(Acceptable)*	NA
Marine Invertebrates	Acute	TGAI	Mysid Shrimp (*Americamysis bahia*) 850.1035	*Mortality* *LC_{50} >0.026 mg a.i./L*	49677734 *(Acceptable)*	NA
		GF-3301	Mysid Shrimp (*Americamysis bahia*) 850.1035	*Mortality* *LC_{50} >0.37 mg a.i./L*	496778011 *(Acceptable)*	NA
		TGAI	Eastern Oyster (*Crassostrea virginica*) 850.1025	*Mortality, Shell Growth* *IC_{50} >0.0251 mg a.i./L*	496777733 *(Acceptable)*	NA
		GF-3301	Eastern Oyster	*Mortality, Shell Growth*	496778010	NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
			(*Crassostrea virginica*) 850.1025	*IC_{50} >0.27 mg a.i./L*	*(Acceptable)*	
	Chronic (Life Cycle)	TGAI	Mysid Shrimp (*Americamysis bahia*) 850.1350	*Female Length* *NOAEC <0.0011 mg a.i./L* *LOAEC: 0.0011 mg a.i./L*	49677746 *(Supplemental - quantitative)*	NA
Benthic Invertebrates	Sub-Chronic 10-Day Whole Sediment	TGAI	Midge (*Chironomus dilutus*) 850.1735	*Ash-free Dry Weight* *Pore-water NOAEC: <0.00432 mg a.i./L* *Pore-water LOAEC: 0.00432 mg a.i./L* *Sediment NOAEC: <5.25 mg a.i./L* *Sediment LOAEC: 5.25 mg a.i./L*	49677750 *(Supplemental - quantitative)*	NA
				Survival *Pore-water NOAEC: 0.0346 mg a.i./L* *Pore-water LOAEC: >0.0346 mg a.i./L* *Sediment NOAEC: 83.2 mg a.i./L* *Sediment LOAEC: >83.2 mg a.i./L*		
	28-Day Chronic Whole Sed.	TGAI	Midge (*Chironomus riparius*) OECD 219	*All[1] (in Pore Water)* *NOAEC: 0.00042 mg a.i./L* *LOAEC >0.00042 mg a.i./L*	49677804 *(Supplemental - quantitative)*	NA
	28-Day Chronic Whole Sed.	BE hydroxy X12300837	Midge (*Chironomus riparius*) OECD 218	*Study under review*	TBD	NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
	28-Day Chronic Whole Sed.	Hydroxy Acid X11966341	Midge (*Chironomus riparius*) OECD 218	*Study under review*	TBD	NA
Freshwater Fish	Acute	TGAI	Rainbow Trout (*Oncorhynchus mykiss*) 850.1075	*Mortality* *LC_{50} >0.049 mg a.i./L*	49677735 *(Acceptable)*	NA
			Fathead Minnow (*Pimephales promelas*) 850.1075	*Mortality* *LC_{50} >0.0518 mg a.i./L*	49677736 *(Acceptable)*	NA
			Common Carp (*Cyprinus carpio*) 850.1075	*Mortality* *LC_{50} >0.0414 mg a.i./L*	49677742 *(Acceptable)*	NA
		GF-3206	Common Carp (*Cyprinus carpio*) 850.1075	*Mortality* *LC_{50} >3.2 mg a.i./L*	49677910 *(Acceptable)*	NA
		GF-3301	Common Carp (*Cyprinus carpio*) 850.1075	*Mortality* *LC50 >0.526 mg a.i./L*	49678012 *(Acceptable)*	NA
		Acid X11438848	Rainbow Trout (*Oncorhynchus mykiss*) 850.1075	*Mortality* *LC_{50} >99.4 mg/L* *(125 mg p.e./L)*	49677741 *(Acceptable)*	NA
		Hydroxy Acid X11966341	Common Carp (*Cyprinus carpio*) 850.1075	*Mortality* *LC_{50} >120 mg/L* *(157 mg p.e./L)*	49677740 *(Acceptable)*	Practically Non-toxic

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		Des-Chloro-Acid X12393505	Common Carp (*Cyprinus carpio*) 850.1075	*Mortality* *LC_{50} >90 mg/L* *(126 mg p.e./L)*	49677738 *(Acceptable)*	NA
		Des-chloro XDE-848 BE X12131932	Common Carp (*Cyprinus carpio*) 850.1075	*Mortality* *LC_{50} >1.0 mg/L* *(1.1 mg p.e./L)*	49677739 *(Acceptable)*	NA
		Nitro-Hydroxy Acid X12483137	Common Carp (*Cyprinus carpio*) 850.1075	*Mortality* *LC_{50} >9.6 mg/L* *(11 mg p.e./L)*	49677743 *(Acceptable)*	NA
	Chronic	TGA.I.	Fathead Minnow (*Pimephales promelas*) 850.1400	*All*[1] *NOAEC: 0.0373 mg a.i./L* *LOAEC >0.0373 mg a.i./L*	49677747 *(Acceptable)*	NA
		Acid X11438848	Fathead Minnow (*Pimephales promelas*) 850.1400	*All*[1] *NOAEC: 29.8 mg/L* *(37.5 mg p.e./L)* *LOAEC >29.8 mg/L* *(>37.5 mg p.e./L)*	49677748 *(Acceptable)*	NA
Estuarine / Marine Fish	Acute	TGAI	Sheepshead Minnow (*Cyprinodon variegatus*) 850.1075	*Mortality* *LC_{50} >0.0403 mg a.i./L*	49677737 *(Acceptable)*	NA
Vascular Aquatic Plants	14-Day	TGAI	Duck Weed (*Lemna gibba* G3) 850.4400	*All*[1] *IC_{50} >0.0414 mg a.i./L* *NOAEC: 0.0414 mg a.i./L*	49677765 *(Acceptable)*	NA
		GF-3206	Duck Weed (*Lemna gibba* G3) 850.4400	*Frond number yield* *IC_{50} 26.27 mg a.i./L* *NOAEC: 5.9 mg a.i./L*	49677911 (*Acceptable*)	NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		TGAI	Eurasian Watermilfoil (*Myriophyllum spicatum*) OECD 239	*Total Shoot Length* *EC_{50} 0.0000162 mg a.i./L* *NOAEC: 0.00000483 mg a.i./L*	49677805 (*Acceptable*)	NA
			Carolina Fanwort (*Cabomba caroliniana*) OECD 239	*Total Shoot Length* *EC_{50} 0.00157 mg a.i./L* *NOAEC: 0.000655 mg a.i./L*	49677810 (Under Review)	NA
			Coontail (*Ceratophyllum demersum*) Draft OECD 239, 221	*Fresh weight* *EC_{50} 0.00452 mg a.i./L* *NOAEC: 0.00142 mg a.i./L*	49677815 (Under Review)	NA
		Acid X11438848	Eurasian Watermilfoil (*Myriophyllum spicatum*) Draft OECD 239	*Total Shoot Length* *EC_{50} 0.000497 mg/L* *(0.00569 mg p.e./L)* *NOAEC: 0.000115mg/L* *(0.000145 mg p.e./L)*	49677806 (*Acceptable*)	NA
			Carolina Fanwort (*Cabomba caroliniana*) Draft OECD 239	*Fresh Weight* *EC_{50} 0.119 mg/L* *(0.150 mg p.e./L)* *NOAEC: 0.0469 mg/L* *(0.0590 mg p.e./L)*	49677809 (Under Review)	NA
			Coontail (*Ceratophyllum demersum*) Draft OECD 239	*Fresh weight* *EC_{50} 0.0475 mg/L* *(0.0598 mg p.e./L)* *NOAEC: 0.00143 mg/L* *(0.00180 mg p.e./L)*	49677814 (Under Review)	NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		BE hydroxy X12300837	Eurasian Watermilfoil (*Myriophyllum spicatum*) Draft OECD 239	*Dry weight* *EC_{50} 0.0238 mg/L (0.0246 mg p.e./L) NOAEC: 0.00954 mg/L (0.00986 mg p.e./L)*	49677812 (Under Review)	NA
		Hydroxy Acid X11966341	Eurasian Watermilfoil (*Myriophyllum spicatum*) Draft OECD 239	*Total Shoot Length* *EC_{50} 0.182 mg/L (0.239 mg p.e./L) NOAEC: 0.0305 mg/L (0.040 mg p.e./L)*	49677811 (Under Review)	NA
		Des-chloro BE Ester X12131932	Eurasian Watermilfoil (*Myriophyllum spicatum*) Draft OECD 239	*Fresh weight* *EC_{50} 0.291 mg/L (0.316 mg p.e./L) NOAEC: 0.0305 mg/L (0.0331 mg p.e./L)*	49677808 (Under Review)	NA
		Nitro-Hydroxy Acid X12483137	Eurasian Watermilfoil (*Myriophyllum spicatum*) Draft OECD 239	*Total Shoot Length* *EC_{50} 6.35 mg/L (7.34 mg p.e./L) NOAEC: 0.954 mg/L (1.10 mg p.e./L)*	49677813 (Under Review)	NA
		Des-Chloro-Acid X12393505	Eurasian Watermilfoil (*Myriophyllum spicatum*) Draft OECD 239	*Total Shoot Length* *EC_{50} 1.34 mg/L (1.87 mg p.e./L) NOAEC: 0.305 mg/L (0.426 mg p.e./L)*	49677807 (Under Review)	NA
Freshwater Non-Vascular Plants		TGAI	Green Algae (*Pseudokirchneriella*) 850.4500	*AUC* *IC_{50} >0.0612 mg a.i./L NOAEC: 0.0298 mg a.i./L*	49677768 *(Acceptable)*	NA
			Cyanobacteria	*Yield, Growth Rate*	49677774	NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
			(*Anabaena flos-aquae*) 850.4500	*IC_{50} >0.0513 mg a.i./L* *NOAEC: 0.0285 mg a.i./L*	*(Acceptable)*	
			Freshwater Diatom (*Navicula pelliculosa*) 850.4500	*Yield, Growth Rate* *IC_{50} >0.0565 mg a.i./L* *NOAEC: 0.0124 mg a.i./L*	49677767 *(Acceptable)*	NA
		GF-3206	Green Algae (*Pseudokirchneriella*) 850.4500	*Yield* *IC_{50} = 4.658 mg a.i./L* *NOAEC: 0.3 mg a.i./L*	49677912 *(Acceptable)*	NA
		GF-3301	Green Algae (*Pseudokirchneriella*) 850.4500	*Yield, Growth Rate, AUC* *IC_{50} >2.12 mg a.i./L* *NOAEC: 0.499 mg a.i./L*	49678013 *(Acceptable)*	NA
		Acid X11438848	Green Algae (*Pseudokirchneriella*) 850.4500	*IC_{50} = 75.85 mg/L** *(95.43 mg p.e./L)* *NOAEC: 50.3 mg/L* *(63.3 mg p.e./L)* **CETIS was unable to calculate a value using Probit. This value was the result of a linear integration of the only two available endpoint level values (one below 50% mortality and one above %0% mortality).*	49677769 *(Acceptable)*	NA
		Hydroxy Acid X11966341	Freshwater Diatom (*Navicula pelliculosa*) 850.4500	*Yield, Growth Rate* *IC_{50} >11 mg/L* *(14 mg p.e./L)* *NOAEC: 1.5 mg/L* *(2.0 mg p.e./L)*	49677770 *(Acceptable)*	NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		Des-Chloro-Acid X12393505	Freshwater Diatom (*Navicula pelliculosa*) 850.4500	*Yield, Growth Rate* *IC_{50} >9.9 mg/L* *(13.8 mg p.e./L)* *NOAEC: 5.0 mg/L* *(7.0 mg p.e./L)*	49677771 *(Acceptable)*	NA
		Nitro-Hydroxy Acid X12483137	Freshwater Diatom (*Navicula pelliculosa*) 850.4500	*Yield* *IC_{50} = 5.62 mg/L* *(6.49 mg p.e./L)* *NOAEC: 1.4 mg/L* *(1.6 mg p.e./L)*	49677772 *(Acceptable)*	NA
		Des-chloro BE Ester X12131932	Freshwater Diatom (*Navicula pelliculosa*) 850.4500	*Yield, Growth Rate* *IC_{50} >1.3 mg/L* *(>1.4 mg p.e./L)* *NOAEC: 1.3 mg/L* *(1.4 mg p.e./L)*	49677773 *(Acceptable)*	NA
Estuarine / Marine Non-vascular Plants		TGAI	Marine Diatom (*Skeletonema costatum*) 850.4500	*Yield* *IC_{50} >0.0389 mg a.i./L* *NOAEC: 0.0124 mg a.i./L*	49677766 *(Acceptable)*	NA
Birds	Acute	TGAI	Bobwhite (*Colinus virginianus*) 850.2100	*Mortality* *LD_{50} >2,250 mg a.i./kg bw*	49677751 *(Acceptable)*	Practically Non-Toxic
			Zebra Finch (*Taeniopygia guttata*) 850.2100	*Mortality* *LD_{50} >2,250 mg a.i./kg bw*	49677752 *(Acceptable)*	Practically Non-Toxic

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
			Bobwhite (*Colinus virginianus*)	*Mortality* *LC_{50} >5,640 mg a.i./kg diet*	49677753 *(Acceptable)*	Practically Non-Toxic
			Mallard (*Anas platyrhynchos*) 850.2200	*Mortality* *LC_{50} >5,640 mg a.i./kg diet*	49677754 *(Acceptable)*	Practically Non-Toxic
	Chronic	TGAI	Bobwhite (*Colinus virginianus*) 850.2200	*Food Consumption* *NOAEC: 398 mg a.i./kg diet* *LOAEC: 999 mg a.i./kg diet*	49677755 *(Acceptable)*	NA
			Mallard (*Anas platyrhynchos*) 850.2300	*All*[1] *NOAEC: 999 mg a.i./kg diet* *LOAEC >999 mg a.i./kg diet*	49677756 *(Acceptable)*	NA
Bees	Oral	TGAI	Honey Bee (*Apis mellifera* L.) OECD 213	*Oral* *LD_{50} >0.1054 mg a.i./bee*	49677757 *(Acceptable)*	Practically Non-Toxic
	Contact		Honey Bee (*Apis mellifera* L.) OECD 214	*Contact* *LC_{50} >0.100 mg a.i./bee*		Practically Non-Toxic
Mammals	Oral	TGAI	Rat (*Rattus norvegicus*) (Winstar)	*LD_{50} >5,000 mg a.i./kg bw*	49677703 *(Acceptable)*	IV
	Dermal	TGAI	Rat (*Rattus norvegicus*) (Winstar)	*LD_{50} >5,000 mg a.i./kg bw*	49677704 *(Acceptable)*	IV

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID (*Classification*)	Toxicity Category
	Inhalation (4-hr.)	TGAI	Rat (unspecified)	*LC_{50} >5.23 mg a.i./L*	49677705 (*Acceptable*)	IV
	Eye Irritation	TGAI	Rabbit (*Oryctolagus cuniculus*)	*Non-Irritating*	49677706 (*Acceptable*)	IV
	Dermal Irritation	TGAI	Rabbit (*Oryctolagus cuniculus*)	*Non-Irritating*	49677707 (*Acceptable*)	IV
	Skin Sensitization / LLNA	TGAI	Mice (unspecified)	*EC_3 = 19.1%*	49677708 (*Acceptable*)	Weak sensitization potential
	Chronic	TGAI	2-Generation Repro.	*NOAEL = 300 mg a.i./kg/day* *NOAEC = 6,000 mg ai/kg diet*	49677855 (*Acceptable*)	
Terrestrial Plants	Seedling Emergence	GF-3206	Most Sensitive Monocot *Onion* (*Allium cepa*) 850.4100	*Dry weight* *EC_{25} = 0.00617 lbs. a.i./A* *NOAEC: 0.0034 lbs. a.i./A*	49677759 (*Acceptable*)	NA
			Most Sensitive Dicot *Carrot* *(Daucus carota)* 850.4100	*Survival* *EC_{25} = 0.00254 lbs. a.i./A* *EC_{05} = 0.000265 lbs. a.i./A.*		NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		Acid X11438848	Most Sensitive Monocot *Onion* (*Allium cepa*) 850.4100	*Survival* *EC_{25} = 0.0129 lbs./A (0.0162 lbs. p.e./A) EC_{05} = 0.000221 lbs./A (0.000278 lbs. p.e./A)*	49677760 *(Acceptable)*	NA
		Acid X11438848	Most Sensitive Dicot *Carrot (Daucus carota)* 850.4100	*Survival* *EC_{25} = 0.000931 lbs./A (0.00117 lbs. p.e./A) EC_{05} = 0.0000247 lbs./A (0.0000311 lbs. p.e./A)*	49677760 *(Acceptable)*	NA
		BE hydroxy X12300837	Most Sensitive Dicot (Monocots were not tested with the minor degradants) 850.4100	*All Dicots* *EC_{25} >0.090 lbs./A (>0.093 lbs. p.e./A) NOAEC: 0.090 lbs./A (0.093 lbs. p.e./A)*	49677761 *(Supplemental - quantitative)*	NA
		Hydroxy Acid X11966341	Most Sensitive Dicot (Monocots were not tested with the minor degradants) 850.4100	*Carrot (Survival)* *EC_{25} = 0.0688 lbs./A (0.0902 lbs. p.e./A) EC_{05} = 0.0437 lbs./A (0.0573 lbs. p.e./A)*	49677761 *(Supplemental - quantitative)*	NA
		Des-chloro BE X12131932	Most Sensitive Dicot (Monocots were not tested with the minor degradants) 850.4100	*All Dicots* *EC_{25} >0.056 lbs./A (>0.0608 lbs. p.e./A) NOAEC: 0.056 lbs./A (0.0608 lbs. p.e./A)*	49677761 *(Supplemental - quantitative)*	NA
		Des-Chloro-Acid	Most Sensitive Dicot (Monocots were not tested with the minor degradants) 850.4100	*All Dicots* *EC_{25} >0.047 lbs./A*	49677761 *(Supplemental - quantitative)*	NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		X12393505		*(>0.066 lbs. p.e./A)* *NOAEC: 0.047 lbs./A* *(0.066 lbs. p.e./A)*		
		Nitro-Hydroxy Acid X12483137		*All Dicots* *EC_{25} >0.089 lbs./A* *(>0.10 lbs. p.e./A)* *NOAEC: 0.089 lbs./A* *(0.10 lbs. p.e./A)*		NA
	Veg. Vigor	GF-3206	Most Sensitive Monocot *Onion* (*Allium cepa*) 850.4150	*Dry weight* *EC_{25} = 0.00415 lbs. a.i./A* *NOAEC: 0.0034 lbs. a.i./A*	49677762 (*Acceptable*)	NA
			Most Sensitive Dicot Soybean (*Glycine max*) 850.4150	*Dry weight* *EC_{25} = 0.0000469 lbs. a.i./A* *NOAEC: 0.000014 lbs. a.i./A*		NA
		Acid X11438848	Most Sensitive Monocot *Onion* (*Allium cepa*) 850.4150	*Dry weight* *EC_{25} = 0.0364 lbs./A* *(0.0458 lbs. p.e./A)* *NOAEC: 0.023 lbs./A* *(0.029 lbs. p.e./A)*	49677763 *(Acceptable)*	NA
			Most Sensitive Dicot Soybean (*Glycine max*) 850.4150	*Dry Weight* *EC_{25} = 0.000389 lbs./A* *(0.000489 lbs. p.e./A)* *NOAEC: 0.00022 lbs./A* *(0.00028 lbs. p.e./A)*		NA

Taxon	Study Format	Material	Species Guidance	*Toxicity Endpoints*	MRID *(Classification)*	Toxicity Category
		BE hydroxy X12300837	Most Sensitive Dicot (Monocots were not tested with the minor degradants) 850.4150	*All Dicots* *EC_{25} >0.090 lbs./A (>0.093 lbs. p.e./A) NOAEC: 0.090 lbs./A (0.093 lbs. p.e./A)*	49677764 *(Supplemental - quantitative)*	NA
		Hydroxy Acid X11966341		*Soybean (Dry Weight) EC_{25} = 0.0723 lbs./A (0.0948 lbs. p.e./A) NOAEC: 0.022 lbs./A (0.029 lbs. p.e./A)*		NA
		Des-chloro BE Ester X12131932		*All Dicots EC_{25} >0.056 lbs./A (>0.061 lbs. p.e./A) NOAEC: 0.056 lbs./A (0.061 lbs. p.e./A)*		NA
		Des-Chloro-Acid X12393505		*All Dicots EC_{25} >0.047 lbs./A (>0.066 lbs. p.e./A) NOAEC: 0.047 lbs./A (0.066 lbs. p.e./A)*		NA
		Nitro-Hydroxy Acid X12483137		*All Dicots EC_{25} >0.089 lbs./A (>0.10 lbs. p.e./A) NOAEC: 0.089 lbs./A (0.10 lbs. p.e./A)*		NA

Appendix C. Environmental Fate Data

Table C-1. Classifications of Environmental Fate Studies Submitted for Florpyrauxifen-benzyl

Guideline No	Data Requirement	Study ID	Study Classification	Classification Justification for Supplemental and Unacceptable Studies and/or Other Comments
835.2120	Hydrolysis	49677711	Acceptable	
835.2240	Photolysis in Water	49677712	Supplemental	For the irradiated buffer and natural water samples treated with the phenyl or pyridine labels, recoveries were outside guideline recommendations and decreased over time. Two compounds present at >10% of the applied were not identified.
835.2410	Photodegradation on Soil	49677714	Supplemental	For the irradiated/benzyl ester ring label treatment, material balances decreased to <90% of the applied by study termination. For the irradiated/pyridine label treatment, up to 15.3% of the applied was unextracted by study termination.
835.2370	Photodegradation in Air	49677713	Supplemental	In this non-guideline report, the atmospheric photodegradation half-life was estimated using the Estimation Program Interface (EPI Suite™ software).
835.4100	Aerobic Soil Metabolism	49677715	Supplemental	For samples treated with the benzyl ester ring label, material balances for two of the test soils decreased to <90% of the applied at most sampling intervals by day 30 posttreatment. Unextracted residues totaled maximums of up to 32.92-80.58% of the applied. A companion study (MRID 49677717, see below), performed with three of the soils used in the aerobic soil metabolism study, and conducted under similar conditions, provided further information indicating that using a three additional solvents with a wide range of dielectric constants, the maximum levels of additionally extracted radioactivity was <3% of the applied.
	Aerobic Soil Metabolism (Flooded System)	49677716	Supplemental	Unextracted residues in the soil totaled maximums of up to 61.0% of the applied; additional extraction procedures were shown to be successful but were not used with most samples. It was not stated whether the reported redox potentials were measured or standard values. Based on the narrative and the figure depicting the test system, it appears that air flow was in place through the water layer (flow rate not specified) to promote aerobicity. This air flow may have caused mixing at a faster rate than in an unmixed system. The Italian soils taxonomic classifications were not provided.
Non-guideline	Use of Different Solvents for Extractions	49677717	Supplemental	The purpose of this non-guideline study was to determine if additional extraction steps would reduce the concentration of unextracted residues. After four extractions with acetonitrile:0.1 N HCl (90:10, v:v), no secondary extraction with acetone, hexane and ethyl acetate at room temperature/ambient conditions, yielded >3% of the applied.
835.4200	Anaerobic Soil Metabolism	49677718	Supplemental	Significant levels (≥10% of the applied) of unextracted residues were observed in the soils. It was not stated whether the reported redox potentials were measured or standard values, and information about the probe used to measure redox was not provided (clarification is required). For all test soils treated with [benzyl ester-U-^{14}C]-labeled XDE-848 Benzyl Ester, material balances were <90% of the applied for the entire duration of the anaerobic phase of the study. For the PH and PY-[^{14}C]-labeled XDE-848 Benzyl Ester in all soils, the duration of the test was not sufficient to allow to describe the pattern of formation and decline of the degradate XR-848 Hydroxy acid.

Guideline No	Data Requirement	Study ID	Study Classification	Classification Justification for Supplemental and Unacceptable Studies and/or Other Comments
835.4300	Aerobic Aquatic Metabolism	49677719	Supplemental	Unextracted residues (UERs) in the sediment totaled maximums of up to 42.12% of the applied. For samples treated with the benzyl ester ring label, material balances decreased to 65.93-67.71% of the applied. It was not stated whether the reported redox potentials were measured or standard values. Clarification is required. A relatively high water pH for both sediment systems throughout this study may have promoted the hydrolysis of XR-848 benzyl ester. According to the study, air was bubbled through the aqueous layer of samples (flow rate not specified) presumably to promote aerobicity. This air flow may have caused mixing at a faster rate than in an unmixed system.
835.4400	Anaerobic Aquatic Metabolism	49677720	Supplemental	Sampling intervals were too infrequent to accurately assess the rate of decline of XDE-848 benzyl ester and the formation and decline of transformation products. For samples treated with the benzyl ester ring label, material balances were as low as 26.9-36.3% of the applied. A relatively high water and sediment pH throughout this study in both systems may have promoted the hydrolysis of XR-848 benzyl ester. Nitrogen gas was bubbled through the aqueous layer of samples (flow rate not specified), presumably to promote anaerobicity. This gas flow may have caused mixing at a faster rate than in an unmixed system.
835.1230	Leaching-Adsorption/ Desorption	49677709	Supplemental	Soil samples were sterilized by gamma irradiation prior to treatment to minimize degradation during the adsorption tests. Mass balances were outside the acceptable limits (90-110% AR) for a number of soils. A desorption phase was not conducted.
		49677710	Supplemental	Soil samples were sterilized by gamma irradiation prior to treatment, presumably to minimize degradation during the sorption tests.
835.1410	Laboratory Volatility	No data submitted	Not applicable	
835.6100	Terrestrial Field Dissipation	No data submitted	Not applicable	The aquatic field dissipation conducted on a rice field included a soil component (*i.e.*, MRID 49677721).
835.6200	Aquatic Field Dissipation (Rice)	49677721	Acceptable	
	Aquatic Field Dissipation (Pond at 50 ppb)	49677722	Acceptable	
	Aquatic Field Dissipation (Pond at 150 ppb)	49677723	Acceptable	
835.6300	Forestry Field Dissipation	No data submitted	Not applicable	Not applicable to the use pattern.
835.6400	Combination and Tank Mixes	No data submitted	Not applicable	
850.1730	Fish BCF	49677749	Supplemental	The nominal (target) concentration of the high-dose samples was twice the limit of solubility of the test substance in water. The bioconcentration factors were determined based on the total radioactive residue instead of the parent compound. The water pH during the exposure period was alkaline (8.1-8.5), which could have promoted hydrolysis of the test substance to the acid form.
850.1950	Aquatic Non-target Organism	No data submitted	Not applicable	
835.7100	Ground Water Monitoring	No data submitted	Not applicable	
835.8100	Field Volatility	No data submitted	Not applicable	
860.1340/ 860.1380	Storage Stability (soil)	49677832 50093901	Supplemental	The study provides useful supplemental information in support of three aquatic field dissipation studies (49677721, 49677722 and 49677723).

Guideline No	Data Requirement	Study ID	Study Classification	Classification Justification for Supplemental and Unacceptable Studies and/or Other Comments
	Storage Stability (water)	49677833 50093902	Supplemental	The study provides useful supplemental information in support of three aquatic field dissipation studies (49677721, 49677722 and 49677723).
850.6100	ECM/ILV in Soil or Soil/Sediment	49677722 49677777	Supplemental	In the ECM, representative chromatograms did not support the specificity of the method for all analytes in both matrices. Further, in the ILV, representative chromatograms were not provided for all fortification levels. Submission of additional representative chromatograms is required.
		49677775 49677776	Unacceptable	The main issue found in this study is that the *LOQs are greater than the lowest toxicological level of concern* ***in soil*** for florpyrauxifen-benzyl and its metabolites. In the ILV, no samples were prepared at 10×LOQ; a minimum of five spiked replicates should be analyzed at each concentration (*i.e.*, minimally, the LOQ and 10×LOQ) for each analyte. In lieu of 10×LOQ, the ILV presents results at 100×LOQ. The sets of representative chromatograms were incomplete in the ECM and ILV. In the ILV, only a soil was tested (no sediment), and it is not known whether the most difficult matrix was selected. A justification for the selection of soil should be provided.
850.6100	ECM/ILV in Water	49677722 49677803	Supplemental	In the ECM, the reproducibility of analyses of florpyrauxifen-benzyl (SX-1552), 1552-DA and 1552-Acid did not meet guidelines at fortifications of LOQ or 10×LOQ in one or both pond waters. In the ECM, representative chromatograms did not support the specificity of the method for all analytes in both matrices. In the ILV, representative chromatograms were not provided for all fortifications. Sample recoveries were corrected in the ECM. The determinations of the LOQ and LOD were not based on scientifically acceptable procedures. The same laboratory, provided the water characterization for both, the ECM and ILV (*i.e.*, Agvise Laboratories). This issue does not affect the validity of the ECM/ILV.
		49677801 49677802	Supplemental	In the ILV, <u>no</u> samples were prepared at 10×LOQ. In the ILV, chromatograms for three of the six analytes showed matrix interferences which affected the peak attenuation of the analyte in all matrices. The sets of representative chromatograms were not complete in the ECM and ILV. A new ILV, including testing at LOQ and 10×LOQ is required. Further, representative chromatograms are needed on the ECM.
860.1340/ 860.1380	Storage Stability (in Support of Field Dissipation Studies, Soil)	50093901	Supplemental	The study provides useful supplemental information in support of three aquatic field dissipation studies (49677721, 49677722 and 49677723, see above). *No DER was generated for this study.* Instead, results are summarized in the Comments section of DER for MRID 49677721.
860.1340/ 860.1380	Storage Stability (in Support of Field Dissipation Studies, Water)	50093902	Supplemental	The study provides useful supplemental information in support of three aquatic field dissipation studies (49677721, 49677722 and 49677723, see above). *No DER was generated for this study.* Instead, results are summarized in the Comments section of DER for MRID 49677721.

ECM = Environmental Chemistry Method; ILV = Independent Laboratory Validation

Appendix D. Aquatic Exposure Modeling

Estimation of the Heat of Henry Using the HENRYWIN Output File from EPI SUITE

The Heat of Henry was calculated, based on the HENRYWIN output file. HENRYWIN is a module of the Estimations Program Interface (EPISUITE).

For Florpyrauxifen-benzyl

Based on these calculations, the Heat of Henry for florpyrauxifen-benzyl was determined to be ***52845 J/mol***.

Heat of Henry = 6500 x 8.13 J/mol = 52845 J/mole for Florpyrauxifen-benzyl

```
       Bond Est :  4.40E-015 atm-m3/mole  (4.46E-010 Pa-m3/mole)
       Group Est:  Incomplete

SMILES : O=C(c3c(CL)c(N)c(F)c(c2c(F)c(OC)c(CL)cc2)n3)OCc1ccccc1
CHEM   :
MOL FOR: C20 H14 CL2 F2 N2 O3
MIL WT : 439.25
--------------------------- HENRYWIN v3.20 Results --------------------------

Henry LC Temperature Variation:
  Slope Source:  Aniline type slope analogy
     HLC (atm-m3/mole) = exp(-11.2562 - (6500/T)) {T in deg K}
  Temp (C)    atm-m3/mole    unitless      Pa-m3/mole
  --------    -----------    --------      ----------
      0        5.99E-016     2.67E-014     6.07E-011
      5        9.18E-016     4.02E-014     9.3E-011
     10        1.39E-015     5.97E-014     1.41E-010
     15        2.07E-015     8.74E-014     2.09E-010
     20        3.04E-015     1.26E-013     3.08E-010
     25        4.4E-015      1.8E-013      4.46E-010
     30        6.31E-015     2.54E-013     6.39E-010
     35        8.93E-015     3.53E-013     9.05E-010
     40        1.25E-014     4.87E-013     1.27E-009
     45        1.73E-014     6.64E-013     1.76E-009
     50        2.38E-014     8.97E-013     2.41E-009
```

CLASS	BOND CONTRIBUTION DESCRIPTION	COMMENT	VALUE
HYDROGEN	5 Hydrogen to Carbon (aliphatic) Bonds		-0.5984
HYDROGEN	7 Hydrogen to Carbon (aromatic) Bonds		-1.0801
HYDROGEN	2 Hydrogen to Nitrogen Bonds		2.5670
FRAGMENT	1 C-Car		0.1619
FRAGMENT	2 C-O		2.1709
FRAGMENT	16 Car-Car		4.2209
FRAGMENT	2 Car-CL		-0.0482
FRAGMENT	1 Car-CO		1.2387
FRAGMENT	2 Car-Nar		3.2564
FRAGMENT	1 CO-O		0.0714

```
 FRAGMENT |   1  Car-Car Ring-to-Ring (biphenyl-type)   |         |  0.1490
 FRAGMENT |   1  Car-N                                  |         |  0.7304
 FRAGMENT |   2  Car-F                                  |         | -0.4427
 FRAGMENT |   1  Car-O                                  |         |  0.3473
----------+---------------------------------------------+---------+----------
 RESULT   |    BOND ESTIMATION METHOD for LWAPC VALUE   |  TOTAL  | 12.745
----------+---------------------------------------------+---------+----------
HENRYs LAW CONSTANT at 25 deg C = 4.40E-015 atm-m3/mole
                                = 1.80E-013 unitless
                                = 4.46E-010 Pa-m3/mole

--------+---------------------------------------------+------------+--------
        |        GROUP CONTRIBUTION DESCRIPTION       |   COMMENT  |  VALUE
--------+---------------------------------------------+------------+--------
        |           1  NH2 (Car)                      |  ESTIMATE  |  4.00
        |           1  Car (N)(Car)(Car)              |  ESTIMATE  | -0.50
        |           1  CH2 (Car)(O)                   |  ESTIMATE  |  0.02
        |           1  CH3 (X)                        |            | -0.62
        |           7  Car-H (Car)(Car)               |            |  0.77
        |           1  Car (C)(Car)(Car)              |            |  0.70
        |           2  Car (Car)(Car)(Car) external   |  ESTIMATE  |  0.66
        |           2  Car (Car)(Car)(CL)             |            |  0.36
        |           1  Car (Car)(Car)(O)              |            | -0.43
        |           1  CO (O)(Car)                    |            |  4.57
        |           1  O (C)(Car)                     |            |  1.25
        |           1  O (C)(CO)                      |            | -0.53
        |           1  Nar (Car)(Car)                 |            |  3.06
        |           2  Car (Car)(Car)(F)              |  ESTIMATE  | -0.68
        |              MISSING Value for:  Car (Nar)(Car)(CO)
--------+---------------------------------------------+------------+--------
 RESULT |  GROUP ESTIMATION METHOD for LOG GAMMA VALUE  | INCOMPLETE | 12.63
--------+---------------------------------------------+------------+--------
```

Florpyrauxifen-benzyl TTR Example Output File, using the K_{OC} for the Parent

```
 Pesticide in Flooded Applications (PFAM)
 Version 2
 10/11/2016 8:29:24 AM
******* Summary of Paddy Concentration Rankings ********

********************************************************
**************  Analysis for Parent        *************
Max released concentration (ppb) =   104.
Index for max concentration      =      10129

 1-in-10 Year Return Concentrations:
********* WATER COLUMN CONCENTRATION (ug/L) ************
Water Column Peak                =   29.7
Water Column 1-day Avg           =   6.60
Water Column 4-day Avg           =   1.82
Water Column 21-day Avg          =  0.759
Water Column 60-day Avg          =  0.391
Water Column 90-day Avg          =  0.322
Water Column 365-day Avg         =  0.914E-01

****** BENTHIC PORE WATER (ug/L) Concentration *********
Benthic Pore Water  Peak         =  0.265
Benthic Pore Water 4-day Avg     =  0.264
```

```
Benthic Pore Water 21-day Avg    =  0.256
Benthic Pore Water 60-day Avg    =  0.241
Benthic Pore Water 90-day Avg    =  0.230
 Benthic Pore Water 365-day Avg  =  0.144

***** BENTHIC TOTAL CONCENTRATION (Mass/Dry Mass) ******
Benthic Total Conc. Peak         =   85.7
 Benthic Total Conc. 4-day Avg   =   85.3
Benthic Total Conc. 21-day Avg   =   82.7
Benthic Total Conc. 60-day Avg   =   77.7
Benthic Total Conc. 90-day Avg   =   74.5
Benthic Total Conc. 365-day Avg  =   46.5
********************************************************
```

Ancillary Information for the Same Run

```
 Pesticide in Flooded Applications (PFAM)
 Version 2
 10/11/2016 8:29:24 AM
 Paddy Information
 *****************************************************
 Sediment_Conversion_Factor=    323.170370370370
 (ug/L aqueous to ug / kg dry mass)
 *****************************************************
 Effective compartment halflives averaged over simulation duration:

 ----Chemical            1
 Washout halflife           =    14.4497556525695
 Aerobic halflife           =    3869.13717758578
 Hydrolysis halflife        =    321180642.429798
 Photolysis halflife        =    5.81241905519050
 Volatilization halflife    =    5.68323128406560
 Leakage halflife(water col) =                Infinity
 Benthic Metabolism halflife =    428.866039625996
 Benthic Hydrolysis halflife =    261216964088.239
```

Appendix E. Example T-REX Output

Summary of Risk Quotient Calculations Based on Upper Bound Kenaga EECs

Table X. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients														
Size Class (grams)	**Adjusted LD50**	**EECs and RQs**												
		Short Grass		**Tall Grass**		**Broadleaf Plants**		**Fruits/Pods/Seeds**		**Arthropods**		**Granivore**	
		EEC	**RQ**	**EEC**	**RQ**	**EEC**	**RQ**	**EEC**	**RQ**	**EEC**	**RQ**	**EEC**	**RQ**
20	1168.26	12.88	0.01	5.90	0.01	7.24	0.01	0.80	<.01	5.04	<.01	0.18	<.01
100	1487.25	7.34	<.01	3.37	<.01	4.13	<.01	0.46	<.01	2.88	<.01	0.10	<.01
1000	2100.80	3.29	<.01	1.51	<.01	1.85	<.01	0.21	<.01	1.29	<.01	0.05	<.01

Table X. Upper Bound Kenaga, Subacute Avian Dietary Based Risk Quotients										
	EECs and RQs									
	Short Grass		**Tall Grass**		**Broadleaf Plants**		**Fruits/Pods/Seeds**		**Arthropods**	
LC50	**EEC**	**RQ**	**EEC**	**RQ**	**EEC**	**RQ**	**EEC**	**RQ**	**EEC**	**RQ**
5640	11.31	<.01	5.18	<.01	6.36	<.01	0.71	<.01	4.43	<.01

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients										
	EECs and RQs									
	Short Grass		Tall Grass		Broadleaf Plants		Fruits/Pods/Seeds		Arthropods	
NOAEC (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
398	11.31	0.03	5.18	0.01	6.36	0.02	0.71	<.01	4.43	0.01

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients														
Size Class (grams)	Adjusted LD50	EECs and RQs												
		Short Grass		Tall Grass		Broadleaf Plants		Fruits/Pods/Seeds		Arthropods		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	10989.15	10.78	<.01	4.94	<.01	6.06	<.01	0.67	<.01	4.22213702	<.0104	0.1497	1E-05
35	8891.40	7.45	<.01	3.41	<.01	4.19	<.01	0.47	<.01	2.91806153	<.0103	0.1035	1E-05
1000	3845.80	1.73	<.01	0.79	<.01	0.97	<.01	0.11	<.01	0.6765628	<.0102	0.024	6E-06

Table X. Upper Bound Kenaga, Acute Mammalian Dietary Based Risk Quotients										
	EECs and RQs									
	Short Grass		Tall Grass		Broadleaf Plants		Fruits/Pods/Seeds		Arthropods	
LC50 (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
0	11.31	#DIV/0!	5.18	#DIV/0!	6.36	#DIV/0!	0.71	#DIV/0!	4.43	#DIV/0!

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Mammalian Dietary Based Risk Quotients										
NOAEC (ppm)	EECs and RQs									
	Short Grass		Tall Grass		Broadleaf Plants		Fruits/Pods/Seeds/Large Insects		Arthropods	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
6000	11.31	<.01	5.18	<.01	6.36	<.01	0.71	<.01	4.43	<.01

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients													
Size Class (grams)	Adjusted NOAEL	EECs and RQs											
		Short Grass		Tall Grass		Broadleaf Plants		Fruits/Pods/Seeds		Arthropods		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	659.35	10.78	0.02	4.94	0.01	6.06	0.01	0.67	<.01	4.22	0.01	0.15	<.01
35	533.48	7.45	0.01	3.41	0.01	4.19	0.01	0.47	<.01	2.92	0.01	0.10	<.01
1000	230.75	1.73	0.01	0.79	<.01	0.97	<.01	0.11	<.01	0.68	<.01	0.02	<.01

Appendix F. Example KABAM Output

Aquatic Use (Max. Rate)

Input Values

Table F-1. Chemical characteristics of florpyrauxifen-benzyl (Aquatic Use, Max. Rate).		
Characteristic	**Value**	**Comments/Guidance**
Pesticide Name	florpyrauxifen-benzyl	**Required input**
Log K_{OW}	**5.5**	**Required input** Enter value from acceptable or supplemental study submitted by registrant or available in scientific literature.
K_{OW}	**316228**	No input necessary. This value is calculated automatically from the Log K_{OW} value entered above.
K_{OC} (L/kg OC)	**32280**	**Required input** Input value used in PRZM/EXAMS to derive EECs. Follow input parameter guidance for deriving this parameter value (USEPA 2002).
Time to steady state (T_S; days)	**88**	No input necessary. This value is calculated automatically from the Log K_{OW} value entered above.
Pore water EEC (μg/L)	**0.570**	**Required input** Enter value generated by PRZM/EXAMS benthic file. PRZM/EXAMS EEC represents the freely dissolved concentration of the pesticide in the pore water of the sediment. The appropriate averaging period of the EEC is dependent on the specific pesticide being modeled and is based on the time it takes for the chemical to reach steady state. Select the EEC generated by PRZM/EXAMS which has an averaging period closest to the time to steady state calculated above. In cases where the time to steady state exceeds 365 days, the user should select the EEC representing the average of yearly averages. The peak EEC should not be used.
Water Column EEC (μg/L)	**8.17**	**Required input** Enter value generated by PRZM/EXAMS water column file. PRZM/EXAMS EEC represents the freely dissolved concentration of the pesticide in the water column. The appropriate averaging period of the EEC is dependent on the specific pesticide being modeled and is based on the time it takes for the chemical to reach steady state. The averaging period used for the water column EEC should be the same as the one selected for the pore water EEC (discussed above).

Table F-2. Input parameters for rate constants. "calculated" indicates that model will calculate rate constant.					
Trophic level	**k_1 (L/kg*d)**	**k_2 (d^{-1})**	**k_D (kg-food/kg-org/d)**	**k_E (d^{-1})**	**k_M* (d^{-1})**
phytoplankton	calculated	calculated	0*	0*	0
zooplankton	calculated	calculated	calculated	calculated	0
benthic invertebrates	calculated	calculated	calculated	calculated	0
filter feeders	calculated	calculated	calculated	calculated	0
small fish	calculated	calculated	calculated	calculated	1.74
medium fish	calculated	calculated	calculated	calculated	1.74
large fish	calculated	calculated	calculated	calculated	1.74

* Default value is 0.

k_1 and k_2 represent the uptake and elimination constants respectively, through respiration.

k_D and k_E represent the uptake and elimination constants, respectively, through diet.

k_M represents the metabolism rate constant.

Table F-3. Mammalian and avian toxicity data for florpyrauxifen-benzyl. These are required inputs.				
Animal	**Measure of effect (units)**	**Value**	**Species**	**If selected species is "other," enter body weight (in kg) here.**
Avian	LD_{50} (mg/kg-bw)	2250	Northern bobwhite quail	
	LC_{50} (mg/kg-diet)	5640	mallard duck	
	NOAEC (mg/kg-diet)	398	Northern bobwhite quail	
	Mineau Scaling Factor	1.15	Default value for all species is 1.15 (for chemical specific values, see Mineau et al. 1996).	
Mammalian	LD_{50} (mg/kg-bw)	5000	laboratory rat	
	LC_{50} (mg/kg-diet)	N/A	other	
	Chronic Endpoint	300	laboratory rat	
	units of chronic endpoint*	ppm		

*ppm = mg/kg-diet

Table F-4. Abiotic characteristics of the model aquatic ecosystem.		
Characteristic	**Value**	**Guidance***
Concentration of Particulate Organic Carbon (X_{POC}; kg OC/ L)	0.00E+00	When using EECs generated by PRZM/EXAMS, use a value of "0" for both POC and DOC.
Concentration of Dissolved Organic Carbon (X_{DOC}; kg OC/L)	0.00E+00	
Concentration of Dissolved Oxygen (C_{OX}; mg O_2/L)	5.0	Default value is 5.0 mg O_2/L when using EECs generated by PRZM/EXAMS.
Water Temperature (T; °C)	15	Value is defined by the average water temperature of the EXAMS pond when using EECs generated by PRZM/EXAMS. Model user should consult output file of EXAMS to define this value.
Concentration of Suspended Solids (C_{SS}; kg/L)	3.00E-05	Default value is 3.00×10^{-5} kg/L when using EECs generated by PRZM/EXAMS.
Sediment Organic Carbon (OC; %)	4.0%	Default value is 4.0% when using EECs generated by PRZM/EXAMS.
*When using pesticide concentrations from monitoring data or mesocosm studies, consult Appendix B of the User's Guide for specific guidance on selecting values for these parameters.		

Table F-5. Characteristics of aquatic biota of the model ecosystem.					
Trophic Level	**Wet Weight (kg)**	**% lipids**	**% NLOM**	**% Water**	**Do organisms in trophic level respire some pore water?**
sediment*	N/A	0.0%	4.0%	96.0%	N/A
phytoplankton	N/A	2.0%	8.0%	90.0%	no
zooplankton	1.0E-07	3.0%	12.0%	85.0%	no
benthic invertebrates	1.0E-04	3.0%	21.0%	76.0%	yes
filter feeders	1.0E-03	2.0%	13.0%	85.0%	yes
small fish	1.0E-02	4.0%	23.0%	73.0%	yes
medium fish	1.0E-01	4.0%	23.0%	73.0%	yes
large fish	1.0E+00	4.0%	23.0%	73.0%	no
*Note that sediment is not a trophic level. It is included in this table because it is consumed by aquatic organisms of the KABAM foodweb. N/A = not applicable					

Table F-6. Diets of aquatic biota of the model ecosystem.						
	Diet for:					
Trophic level in diet	**Zoo plankton**	**Benthic Invertebrates**	**Filter Feeder**	**Small Fish**	**Medium Fish**	**Large Fish**
sediment*	0.0%	34.0%	34.0%	0.0%	0.0%	0.0%
phytoplankton	100.0%	33.0%	33.0%	0.0%	0.0%	0.0%

Table F-6. Diets of aquatic biota of the model ecosystem.						
	Diet for:					
Trophic level in diet	Zoo plankton	Benthic Invertebrates	Filter Feeder	Small Fish	Medium Fish	Large Fish
zooplankton		33.0%	33.0%	50.0%	0.0%	0.0%
benthic invertebrates			0.0%	50.0%	50.0%	0.0%
filter feeders				0.0%	0.0%	0.0%
small fish					50.0%	0.0%
medium fish						100.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Note that sediment is not a trophic level. It is included in this table because it is consumed by aquatic organisms of the KABAM foodweb.

Table F-7. Identification of mammals and birds feeding on aquatic biota of the model ecosystem.		
Mammal/Bird #	Name	Body weight (kg)
Mammal 1	fog/water shrew	0.018
Mammal 2	rice rat/star-nosed mole	0.085
Mammal 3	small mink	0.45
Mammal 4	large mink	1.8
Mammal 5	small river otter	5
Mammal 6	large river otter	15
Bird 1	sandpipers	0.02
Bird 2	cranes	6.7
Bird 3	rails	0.07
Bird 4	herons	2.9
Bird 5	small osprey	1.25
Bird 6	white pelican	7.5

Table F-8. Diets of mammals feeding on aquatic biota of the model ecosystem.						
	Diet for:					
Trophic level in diet	fog/water shrew	rice rat/star-nosed mole	small mink	large mink	small river otter	large river otter
phytoplankton	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
zooplankton	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
benthic invertebrates	100.0%	34.0%	0.0%	0.0%	0.0%	0.0%
filter feeders	0.0%	33.0%	0.0%	0.0%	0.0%	0.0%
small fish	0.0%	33.0%	0.0%	0.0%	0.0%	0.0%
medium fish	0.0%	0.0%	100.0%	100.0%	100.0%	0.0%
large fish	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table F-9. Diets of birds feeding on aquatic biota of the model ecosystem.						
	Diet for:					
Trophic level in diet	sandpipers	cranes	rails	herons	small osprey	white pelican
phytoplankton	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
zooplankton	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
benthic invertebrates	33.0%	33.0%	50.0%	50.0%	0.0%	0.0%
filter feeders	33.0%	33.0%	0.0%	0.0%	0.0%	0.0%
small fish	34.0%	0.0%	50.0%	0.0%	0.0%	0.0%
medium fish	0.0%	34.0%	0.0%	50.0%	100.0%	0.0%
large fish	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table F-10. Input parameters and calculations relevant to derivation of C_B.							
Parameter	Phyto plankton	Zoo plankton	Benthic Invert-ebrates	Filter Feeders	Small Fish	Medium Fish	Large Fish
Equation A1							
C_B	**0.110981**	**0.09491808**	**0.108279**	**0.070999**	**0.006204**	**0.002675**	**0.00074**
C_{BD}	0.000000	0.00802207	0.020735	0.013370	0.002915	0.001182	0.000039
C_{BR}	0.11098111	0.08689601	0.08754323	0.05762929	0.00328890	0.00149292	0.00070483
C_S	0.000736						
C_{WDP}	0.00000057						
C_{WTO}	0.00000817						
k_1	12921.144	42645.308	3800.767	1697.740	758.353	338.744	151.311
k_2	0.851205	3.942857	0.321775	0.218661	0.049906	0.022292	0.009958
k_D	0.000000	0.289822	0.102833	0.044991	0.051538	0.036486	0.025830
k_E	0.000000	0.054114	0.013280	0.008839	0.005054	0.004466	0.003452
k_G	0.100000	0.012559	0.003155	0.001991	0.001256	0.000792	0.000500
k_M	0	0	0	0	1.74	1.74	1.74
m_o	1	1	0.95	0.95	0.95	0.95	1
m_p	0	0	0.05	0.05	0.05	0.05	0
$\Sigma (P_i * C_{Di})$	0	0.11098111	0.068196967	0.06819697	0.10159829	0.05724127	0.00267451
Φ	1.00000000						
Equation A2							
X_{POC}	0.0000000						
X_{DOC}	0.0000000						
K_{OW}	316228						
Φ	1.00000000						
Equation A4							
C_S	0.0007						
C_{SOC}	0.0184						
C_{WDP}	0.00000						
K_{OC}	32280						
OC	4%						
Equation A5							
C_{ox}	N/A	5					
E_W	N/A	0.540397364					
G_V	N/A	0.007891472	0.703328201	3.14165167	14.0332425	62.6841919	280
k_1	12921.14416	42645.30776	3800.767054	1697.74028	758.352727	338.74372	151.311262
K_{OW}	316228						

Table F-10. Input parameters and calculations relevant to derivation of C_B.							
Parameter	Phyto plankton	Zoo plankton	Benthic Invert-ebrates	Filter Feeders	Small Fish	Medium Fish	Large Fish
W_B	N/A	0.0000001	0.0001	0.001	0.01	0.1	1
Equation A6							
k_1	12921.14416	42645.30776	3800.767054	1697.74028	758.352727	338.74372	151.311262
k_2	0.851204645	3.942856897	0.321775299	0.21866144	0.04990649	0.02229241	0.00995765
K_{BW}	15179.83277	10815.8396	11811.86706	7764.24166	15195.4742	15195.4742	15195.4742
K_{OW}	316228						
V_{LB}	0.02	0.03	0.03	0.02	0.04	0.04	0.04
V_{NB}	0.08	0.12	0.21	0.13	0.23	0.23	0.23
V_{WB}	0.9	0.85	0.76	0.85	0.73	0.73	0.73
β	0.35	0.035					
Equation A7							
k_G	0.1	0.012559432	0.003154787	0.00199054	0.00125594	0.00079245	0.0005
T	15						
W_B	N/A	0.0000001	0.0001	0.001	0.01	0.1	1
Equation A8							
C_{ox}	N/A	N/A	N/A	5	N/A	N/A	N/A
C_{SS}	N/A	N/A	N/A	3.00E-05	N/A	N/A	N/A
E_D	N/A	0.477356971					
G_D	N/A	6.07E-08	2.15E-05	9.42E-05	1.08E-03	7.64E-03	5.41E-02
G_V	N/A	N/A	N/A	3.14	N/A	N/A	N/A
k_D	0	2.90E-01	1.03E-01	4.50E-02	5.15E-02	3.65E-02	2.58E-02
K_{OW}	316228						
T	N/A	15					
W_B	N/A	0.0000001	0.0001	0.001	0.01	0.1	1
Equation A9							
C_{ox}	N/A	N/A	N/A	5	N/A	N/A	N/A
C_{SS}	N/A	N/A	N/A	3.00E-05	N/A	N/A	N/A
E_D	N/A	0.4774					
G_D	N/A	0.0000	0.0000	0.0000942	0.0011	0.0076	0.0541
G_F	N/A	0.000000	0.000015	0.000066	0.000726	0.004965	0.034777
G_V	N/A	N/A	N/A	3.1417	N/A	N/A	N/A
k_E	0	0.0541	0.0133	0.0088	0.0051	0.0045	0.0035
K_{GB}	N/A	0.2656	0.1840	0.2799	0.1459	0.1884	0.2079
K_{OW}	N/A	316228					
T	N/A	15					
V_{LB}	N/A	0.03	0.03	0.02	0.04	0.04	0.04
V_{LD}	N/A	0.02	0.01650	0.0165	0.03	0.035	0.04
V_{LG}	N/A	0.007966	0.005876	0.005876	0.003571	0.004311	0.004979
V_{NB}	N/A	0.12	0.21	0.13	0.23	0.23	0.23
V_{ND}	N/A	0.08	0.0796	0.0796	0.165	0.22	0.23
V_{NG}	N/A	0.03186	0.02835	0.02835	0.09819	0.13548	0.14315
V_{WB}	N/A	0.85	0.76	0.85	0.73	0.73	0.73
V_{WD}	N/A	0.9	0.9039	0.9039	0.805	0.745	0.73
V_{WG}	N/A	0.9602	0.9658	0.9658	0.8982	0.8602	0.8519
W_B	N/A	0.0000001	0.0001	0.001	0.01	0.1	1
β	N/A	0.035	0.035	0.035	0.035	0.035	0.035
ε_L	N/A	0.72	0.75	0.75	0.92	0.92	0.92
ε_N	N/A	0.72	0.75	0.75	0.6	0.6	0.6
ε_W	N/A	0.25	0.25	0.25	0.25	0.25	0.25

Table F-10. Input parameters and calculations relevant to derivation of C_B.							
Parameter	Phyto plankton	Zoo plankton	Benthic Invert-ebrates	Filter Feeders	Small Fish	Medium Fish	Large Fish
Calculation of BCF values							
C_{BCF}	0.124019234	0.08836541	0.092014444	0.06048344	0.11837274	0.11837274	0.12414702

See Appendix A of KABAM user's guide and technical documentation for equation details.

Estimation of Km for **florpyrauxifen-benzyl:**
Km = Kt - K2 - Ke – Kg;
K_bw = V_lb*Kow + V_nb*B*Kow +
V_wb

Parameter	Value	Source
Kt_empirical (1/d)	1.77	From Depuration data
K2_empirical (1/d)	0.0264	=K1/K_bw
Kbw	23340	
K1_sequential	616	from K1 in BCF Study
Kg_KABAM_large fish	0.0005	From KABAM
Ke_KABAM_large fish	0.0036	From KABAM
Km_estimated	**1.74**	Km = Kt - K2 - Ke - Kg

	Lipid fraction		**Nonlipid fraction**	constant	**water fraction**	Comments
	V_lb	Kow	**V_nb**	B	**V_wb**	
	0.066	316228	0.223	0.035	0.710	Note: lipid, nonlipid and water fractions are assumed b/c study report not available.
basis:	BCF study		assumption		assumption	

Output Results

Table F-11. Estimated concentrations of florpyrauxifen-benzyl (Aquatic, Max. Rate) in ecosystem components.				
Ecosystem Component	Total concentration (µg/kg-ww)	Lipid normalized concentration (µg/kg-lipid)	Contribution due to diet (µg/kg-ww)	Contribution due to respiration (µg/kg-ww)
Water (total)*	8.17	N/A	N/A	N/A
Water (freely dissolved)*	8.17	N/A	N/A	N/A
Sediment (pore water)*	0.57	N/A	N/A	N/A
Sediment (in solid)**	736	N/A	N/A	N/A
Phytoplankton	110,981	5549056	N/A	110,981.11

Table F-11. Estimated concentrations of florpyrauxifen-benzyl (Aquatic, Max. Rate) in ecosystem components.				
Ecosystem Component	**Total concentration (µg/kg-ww)**	**Lipid normalized concentration (µg/kg-lipid)**	**Contribution due to diet (µg/kg-ww)**	**Contribution due to respiration (µg/kg-ww)**
Zooplankton	94,918	3163936	8,022.07	86,896.01
Benthic Invertebrates	108,279	3609284	20,735.28	87,543.23
Filter Feeders	70,999	3549950	13,369.72	57,629.29
Small Fish	6,204	155101	2,915.14	3,288.90
Medium Fish	2,675	66863	1,181.59	1,492.92
Large Fish	744	18606	39.39	704.83
* Units: µg/L; **Units: µg/kg-dw				

Table F-12. Total BCF and BAF values of florpyrauxifen-benzyl in aquatic trophic levels.		
Trophic Level	**Total BCF (µg/kg-ww)/(µg/L)**	**Total BAF (µg/kg-ww)/(µg/L)**
Phytoplankton	15180	13584
Zooplankton	10816	11618
Benthic Invertebrates	11812	13900
Filter Feeders	7764	9114
Small Fish	15195	788
Medium Fish	15195	343
Large Fish	15195	91

Table F-13. Lipid-normalized BCF, BAF, BMF and BSAF values of florpyrauxifen-benzyl in aquatic trophic levels.				
Trophic Level	**BCF (µg/kg-lipid)/(µg/L)**	**BAF (µg/kg-lipid)/(µg/L)**	**BMF (µg/kg-lipid)/(µg/kg-lipid)**	**BSAF (µg/kg-lipid)/(µg/kg-OC)**
Phytoplankton	758992	679199	N/A	21
Zooplankton	360528	387263	0.57	12
Benthic Invertebrates	393729	463335	1.32	14
Filter Feeders	388212	455718	1.29	14
Small Fish	379887	19707	0.05	1
Medium Fish	379887	8581	0.04	0
Large Fish	379887	2283	0.27	0

Table F-14. Calculation of EECs for mammals and birds consuming fish contaminated by florpyrauxifen-benzyl (Aquatic, Max. Rate).						
	Biological Parameters				EECs (pesticide intake)	
Wildlife Species	Body Weight (kg)	Dry Food Ingestion Rate (kg-dry food/kg-bw/day)	Wet Food Ingestion Rate (kg-wet food/kg-bw/day)	Drinking Water Intake (L/d)	Dose Based (mg/kg-bw/d)	Dietary Based (ppm)
Mammalian						
fog/water shrew	0.02	0.140	0.585	0.003	63.366	108.28
rice rat/star-nosed mole	0.1	0.107	0.484	0.011	30.140	62.29
small mink	0.5	0.079	0.293	0.048	0.785	2.67
large mink	1.8	0.062	0.229	0.168	0.614	2.67
small river otter	5.0	0.052	0.191	0.421	0.512	2.67
large river otter	15.0	0.042	0.157	1.133	0.118	0.74
Avian						
sandpipers	0.0	0.228	1.034	0.004	63.3463	61.27
cranes	6.7	0.030	0.136	0.211	8.1638	60.07
rails	0.1	0.147	0.577	0.010	33.0497	57.24
herons	2.9	0.040	0.157	0.120	8.7324	55.48
small osprey	1.3	0.054	0.199	0.069	0.5338	2.67
white pelican	7.5	0.029	0.107	0.228	0.0797	0.74

Table F-15. Calculation of toxicity values for mammals and birds consuming fish contaminated by florpyrauxifen-benzyl (Aquatic, Max. Rate).				
	Toxicity Values			
	Acute		Chronic	
Wildlife Species	Dose Based (mg/kg-bw)	Dietary Based (mg/kg-diet)	Dose Based (mg/kg-bw)	Dietary Based (mg/kg-diet)
Mammalian				
fog/water shrew	10499.51	N/A	31.50	300
rice rat/star-nosed mole	7122.50	N/A	21.37	300
small mink	4695.52	N/A	14.09	300
large mink	3320.24	N/A	9.96	300
small river otter	2571.84	N/A	7.72	300
large river otter	1954.18	N/A	5.86	300

Avian				
sandpipers	1620.97	5640.00	N/A	398
cranes	3877.31	5640.00	N/A	398
rails	1956.07	5640.00	N/A	398
herons	3419.63	5640.00	N/A	398
small osprey	3014.09	5640.00	N/A	398
white pelican	3943.47	5640.00	N/A	398

Table F-16. Calculation of RQ values for mammals and birds consuming fish contaminated by Florpyrauxifen-benzyl.

Wildlife Species	Acute		Chronic	
	Dose Based	Dietary Based	Dose Based	Dietary Based
Mammalian				
fog/water shrew	0.006	N/A	**2.012**	0.361
rice rat/star-nosed mole	0.004	N/A	**1.411**	0.208
small mink	0.000	N/A	0.056	0.009
large mink	0.000	N/A	0.062	0.009
small river otter	0.000	N/A	0.066	0.009
large river otter	0.000	N/A	0.020	0.002
Avian				
sandpipers	0.039	0.011	N/A	0.154
cranes	0.002	0.011	N/A	0.151
rails	0.017	0.010	N/A	0.144
herons	0.003	0.010	N/A	0.139
small osprey	0.000	0.000	N/A	0.007
white pelican	0.000	0.000	N/A	0.002

Appendix G. TERRPLANT Output

TerrPlant v. 1.2.2

Green values signify user inputs (Tables 1, 2 and 4).

Input and output guidance is in popups indicated by red arrows.

Table 1. Chemical Identity.	
Chemical Name	**Florpyrauxifen-benzyl**
PC code	**30093**
Use	**Rice**
Application Method	**Aerial**
Application Form	**Spray**
Solubility in Water (ppm)	**0.015**

Table 2. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	**0.0268**	**lb./A**
Incorporation	I	**1**	none
Runoff Fraction	R	**0.01**	none
Drift Fraction	D	**0.05**	none

Table 3. EECs for Florpyrauxifen-benzyl. Units in lb./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.000268
Runoff to semi-aquatic areas	(A/I)*R*10	0.00268
Spray drift	**A*D**	**0.00134**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.001608**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.00402**

Table 4. Plant survival and growth data used for RQ derivation. Units are in lb./A.				
Plant type	**Seedling Emergence**		**Vegetative Vigor**	
	EC_{25}	**NOAEC**	**EC_{25}**	**NOAEC**
Monocot	0.00617	0.0034	0.00415	0.0034
Dicot	0.002541	0.0013	0.0000469	0.000014

Table 5. RQ values for plants in dry and semi-aquatic areas exposed to Florpyrauxifen-benzyl through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	0.26	0.65	0.32
Monocot	listed	0.47	1.18	0.39
Dicot	non-listed	0.63	1.58	28.57
Dicot	listed	1.24	3.09	95.71
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

TerrPlant v. 1.2.2

Green values signify user inputs (Tables 1, 2 and 4).

Input and output guidance is in popups indicated by red arrows.

Table 1. Chemical Identity.	
Chemical Name	**Florpyrauxifen-benzyl**
PC code	**30093**
Use	**Foliar**
Application Method	**Aerial**
Application Form	**Spray**
Solubility in Water (ppm)	**0.015**

Table 2. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	**0.0527**	**lb./A**
Incorporation	I	**1**	none
Runoff Fraction	R	**0.01**	none
Drift Fraction	D	**0.05**	none

Table 3. EECs for Florpyrauxifen-benzyl. Units in lb./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.000527
Runoff to semi-aquatic areas	(A/I)*R*10	0.00527
Spray drift	**A*D**	**0.002635**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.003162**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.007905**

Table 4. Plant survival and growth data used for RQ derivation. Units are in lb./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC25**	**NOAEC**	**EC25**	**NOAEC**
Monocot	0.00617	0.0034	0.00415	0.0034
Dicot	0.002541	0.0013	0.0000469	0.000014

Table 5. RQ values for plants in dry and semi-aquatic areas exposed to Florpyrauxifen-benzyl through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	0.51	1.28	0.63
Monocot	listed	0.93	2.33	0.78
Dicot	non-listed	1.24	3.11	56.18
Dicot	listed	2.43	6.08	188.21
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

TerrPlant v. 1.2.2
Green values signify user inputs (Tables 1, 2 and 4).
Input and output guidance is in popups indicated by red arrows.

Table 1. Chemical Identity.	
Chemical Name	**Florpyrauxifen-Acid**
PC code	**30093**
Use	**Rice**
Application Method	**Aerial**
Application Form	**Spray**
Solubility in Water (ppm)	**>100**

Table 2. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	**0.0213**	**lb./A**
Incorporation	I	**1**	none
Runoff Fraction	R	**0.05**	none
Drift Fraction	D	**0.05**	none

Table 3. EECs for Florpyrauxifen-Acid. Units in lb./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.001065
Runoff to semi-aquatic areas	(A/I)*R*10	0.01065
Spray drift	**A*D**	**0.001065**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.00213**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.011715**

Table 4. Plant survival and growth data used for RQ derivation. Units are in lb./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC25**	**NOAEC**	**EC25**	**NOAEC**
Monocot	0.01294	0.0002214	0.0364	0.023
Dicot	0.0009306	0.00054	0.000389	0.00022

Table 5. RQ values for plants in dry and semi-aquatic areas exposed to Florpyrauxifen-Acid through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	0.16	0.91	<0.1
Monocot	listed	9.62	52.91	4.81
Dicot	non-listed	2.29	12.59	2.74
Dicot	listed	3.94	21.69	4.84
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

TerrPlant v. 1.2.2

Green values signify user inputs (Tables 1, 2 and 4).
Input and output guidance is in popups indicated by red arrows.

Table 1. Chemical Identity.	
Chemical Name	**Florpyrauxifen-Acid**
PC code	**30093**
Use	**Foliar**
Application Method	**Aerial**
Application Form	**Spray**
Solubility in Water (ppm)	**>100**

Table 2. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	**0.0419**	**y**
Incorporation	I	**1**	none
Runoff Fraction	R	**0.05**	none
Drift Fraction	D	**0.05**	none

Table 3. EECs for Florpyrauxifen-Acid. Units in y.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.002095
Runoff to semi-aquatic areas	(A/I)*R*10	0.02095
Spray drift	**A*D**	**0.002095**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.00419**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.023045**

Table 4. Plant survival and growth data used for RQ derivation. Units are in y.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC25**	**NOAEC**	**EC25**	**NOAEC**
Monocot	0.01294	0.0002214	0.0364	0.023
Dicot	0.0009306	0.00054	0.000389	0.00022

Table 5. RQ values for plants in dry and semi-aquatic areas exposed to Florpyrauxifen-Acid through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	0.32	1.78	0.16
Monocot	listed	18.93	104.09	9.46
Dicot	non-listed	4.50	24.76	5.39
Dicot	listed	7.76	42.68	9.52
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

Appendix H. Bibliography Studies Submitted to the Agency

039003 Florpyrauxifen-benzyl's <u>Environmental Fate</u> Bibliography (XDE-848 Benzyl Ester, XDE-848 BE, XR-848 BE)

835.2120 Hydrolysis of parent and degradates as a function of pH at 25°C

MRID	Citation Reference
49677711	Guenthenspberger, K.; Balcer, J.; Godbey, J. (2015) Hydrolysis of XR-848 Benzyl Ester and X11438848 at pH 4, 7 and 9. Project Number: 120575, NAFST/11/90. Unpublished study prepared by Dow AgroSciences, LLC. 162 pp.

835.2240 Direct photolysis rate of parent and degradates in water

MRID	Citation Reference
49677712	Taylor, J.; Laughlin, L.; Balcer, J. (2014) Aqueous Photolysis of XR-848 Benzyl Ester in pH4 Buffer and Natural Water under Xenon Light. Project Number: 120732, 120575, 121001, NAFST/12/232, 010127. Unpublished study prepared by Dow AgroSciences, LLC. 266 pp.

835.2370 Photodegradation of parent and degradates in air

MRID	Citation Reference
49677713	Ding, Y. (2014) Estimation of the Photochemical Oxidation Rate of XDE-848 Benzyl Ester. Project Number: 130635, FAPC/G/23/76, NAFST/12/238. Unpublished study prepared by Dow AgroSciences, LLC. 14 pp.

835.2410 Photodegradation of parent and degradates in soil

MRID	Citation Reference
49677714	Blakeslee, B. (2015) [14C] XDE-848 Benzyl Ester - Photodegradation on Soil Surface. Project Number: 130639, 20130147, NAFST/12/232. Unpublished study prepared by Innovative Environmental Services Limited. 107 pp.

835.4100 Aerobic soil metabolism

MRID	Citation Reference
49677715	Taylor, J.; Laughlin, L.; Balcer, J. (2015) Degradation of XR-848 Benzyl Ester in Four Soils under Aerobic Conditions. Project Number: 121106, 120575, 120732,

	nafst/12/232, 130770. Unpublished study prepared by Dow AgroSciences, LLC. 218 pp.
49677716	Laughlin, L.; Balcer, J.; Godbey, J.; et al. (2015) Aerobic Aquatic Degradation of XDE-848 Benzyl Ester in Two Flooded Paddy Soil Systems. Project Number: 120770. Unpublished study prepared by Dow AgroSciences, LLC. 171 pp.
49677717	Lynn, K.; Taylor, J. (2015) Use of Different Solvents for Extracting XDE-848 Benzyl Ester Residues from Treated Soils. Project Number: 150292, 121106, 120575, 120732, 130082. Unpublished study prepared by Dow AgroSciences, LLC. 55 pp.

835.4200 Anaerobic soil metabolism

MRID	Citation Reference
49677718	Blakeslee, B.; Godbey, J. (2015) Soil Degradation of XDE-848 Benzyl Ester under Anaerobic Conditions. Project Number: 130082, 121106, 130770, 121001. Unpublished study prepared by Dow AgroSciences, LLC. 166 pp.

835.4300 Aerobic aquatic metabolism

MRID	Citation Reference
49677719	Guenthenspberger, K.; Balcer, J. (2015) Aerobic Aquatic Degradation of XR-848 Benzyl Ester in 2 Sediment and Pond Water Systems. Project Number: 121001, 120575, 130627. Unpublished study prepared by Dow AgroSciences, LLC. 215 pp.

835.4400 Anaerobic aquatic metabolism

MRID	Citation Reference
49677720	Volkel, W. (2015) [14C]XDE-848 Benzyl Ester - Degradation/Metabolism in Two Aquatic Systems under Anaerobic Conditions. Project Number: 130708, 20130148. Unpublished study prepared by Innovative Environmental Services Limited. 302 pp.

835.1230 Soil and sediment absorption/desorption for parent and degradates (batch equilibrium)

MRID	Citation Reference
49677709	Ding, Y. (2015) Batch Equilibrium Adsorption of XDE-848 Benzyl Ester Metabolites, X11438848, X11966341 and X12300837. Project Number: 130567, 121106, 130770, 130769, 130627. Unpublished study prepared by Dow AgroSciences, LLC. 111 pp.
49677710	Wang, H. (2015) Batch Equilibrium Adsorption/Desorption of XDE-848 Benzyl Ester. Project Number: 130638, 121106, 130770, 130627, NAFST/12/232. Unpublished study prepared by Dow AgroSciences, LLC. 71 pp.

835.6200 Aquatic field dissipation

MRID	Citation Reference

49677721	Jacobson, B.; Chickering, D.; van Wesenbeeck, I. (2015) Aquatic Field Dissipation of the Herbicide XDE-848 BE Under Field Conditions at Two Rice Production Locations (Texas and California). Project Number: 130769, 369/16, 80301, 100023450/000/ 70511/0001. Unpublished study prepared by Dow AgroSciences LLC, ABC Laboratories, Inc. and Waterborne Environmental, Inc. 1143 pp.
49677722 [1]	Petty, D. (2015) Aquatic Dissipation of XDE-848 Benzyl Ester (SX-1552) in Pond Systems (Revised). Project Number: NDR1401, 477G696. Unpublished study prepared by NDR Research, Agvise Laboratories Inc., Agricultural System Associates, EPL-BAS and Florida Pesticide Research. 441 pp.
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850.1730 Fish BCF

MRID	Citation Reference
49677749	Hicks, S. (2015) 14C-XDE-848 Benzyl Ester: Bioconcentration and Metabolism Study with Bluegill, *Lepomis macrochirus*. Project Number: 130986, 69924. Unpublished study prepared by ABC Laboratories, Inc. 124 pp.

850.6100 Environmental Chemistry Methods and Associated Independent Laboratory Validations

MRID	Citation Reference
49677775	Walter, M. (2015) Method Validation Study for the Determination of Residues of XDE-848 Benzyl Ester and Three Metabolites X11438848, X12300837 and X11966341 in Soil by Liquid Chromatography with Tandem Mass Spectrometry. Project Number: 140956, 1/3/6/1/4/1/24263/1/4/15399/2/3/3779/3495, 121106. Unpublished study prepared by Dow AgroSciences LLC. 290 pp.
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49677832	Rebstock, M. (2015) Stability Determination ofXDE-848 Benzyl Ester and Major Metabolites in Soil Under Freezer Storage Conditions. Interim Report - 12 Months Stability Data. Unpublished study performed by ABC Laboratories, Inc., Columbia, MO, and sponsored by Dow AgroSciences LLC, Indianapolis, IN. Dow AgroSciences Study No.: 131252; ABC Laboratories Study No.: 80819. 105 pp.
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030093 Florpyrauxifen-benzyl Ecological Effects Bibliography (XDE-848 Benzyl Ester)

850.1010 Aquatic invertebrate acute toxicity, test, freshwater daphnids

MRID	Citation Reference
49677725	Stadler, T. (2013) XDE-848 **Benzyl Ester:** Acute Toxicity to the Cladoceran, Daphnia magna, Determined Under Static-Renewal Test Conditions. Project Number: 130419, 69709, 69698. Unpublished study prepared by ABC Laboratories, Inc. 74p.
49677726	Bergfield, A. (2013) X11438848 (XDE-848 **Acid)**: Acute Toxicity to the Cladoceran, Daphnia magna, Determined Under Static Test Conditions. Project Number 130420, 69845, 69698. Unpublished study prepared by ABC Laboratories, Inc. 55p.
49677727	Lamichhane, K. (2014) XI1966341 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Cladoceran, Daphnia magna, Exposed Under Static-Renewal Test Conditions. Project Number: 140518, 81028. Unpublished study prepared by ABC Laboratories, Inc. 56p.
49677728	Lamichhane, K. (2014) X12393505 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Cladoceran, Daphnia magna, Exposed Under Static-Renewal Test Conditions. Project Number: 81027, 140546. Unpublished study prepared by ABC Laboratories, Inc. 56p.
49677729	Goudie, O. (2014) X12131932 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Cladoceran, Daphnia magna, Determined Under Static-Renewal Test Conditions. Project Number: 140547, 81168. Unpublished study prepared by ABC Laboratories, Inc. 58p.
49677730	VanHooser, A. (2015) X12483137 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Cladoceran, Daphnia magna, Determined Under Static-Renewal Test Conditions. Project Number: 150201, 82374. Unpublished study prepared by ABC Laboratories, Inc. 53p.
49677909	Lamichhane, K. (2015) **GF 3206:** Acute Toxicity to the Cladoceran, Daphnia magna, Determined Under Static Renewal Test Conditions. Project Number: 150488, 82371, 69698. Unpublished study prepared by ABC Laboratories, Inc. 66p.
49678009	Bradbury, N. (2015) **GF-3301**: Acute Toxicity to the Cladoceran, Daphnia magna, Determined Under Static-Renewal Test Conditions. Project Number: 150483, 82368, 69698. Unpublished study prepared by ABC Laboratories, Inc. 71p.

850.1020 Freshwater Invertebrate Acute Toxicity

MRID Reported Result	Citation Reference
49677731	Romine, J. (2013) XDE-848 Benzyl Ester: Acute Toxicity to the Amphipod, Gammarus pseudolimnaeus, Determined Under Flow-Through Test Conditions. Project Number: 130422, 69819, 69698. Unpublished study prepared by ABC Laboratories, Inc. 75p.
49677732	Romine, J. (2013) XDE-848 Benzyl Ester: Acute Toxicity to the Snail, Lymnaea stagnali, Determined Under Flow-Through Test Conditions. Project Number:

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49677724	Romine, J. (2013) XDE-848 Benzyl Ester: Acute Toxicity to the Freshwater Midge, Chironomus riparius, Determined Under Static-Renewal Test Conditions. Project Number: 130430, 69716, 69698. Unpublished study prepared by ABC Laboratories, Inc. 72p.

850.1025 Oyster acute toxicity test (shell deposition)

MRID	Citation Reference
49677733	Romine, J. (2013) XDE-848 Benzyl Ester: Effect on New Shell Growth of the Eastern Oyster (Crassostrea virginica). Project Number: 130433, 69714, 69698. Unpublished study prepared by ABC Laboratories, Inc. 87p.
49678010	Hadsell, R. (2015) **GF-3301:** Effect on New Shell Growth of the Eastern Oyster Crassostrea virginica. Project Number: 150486, 82370, 82369. Unpublished study prepared by ABC Laboratories, Inc. 72p.

850.1035 Mysid acute toxicity test

MRID	Citation Reference
49677734	Fournier, A. (2013) XDE-848 Benzyl Ester: Acute Toxicity to Mysids (Americamysis bahia). Project Number: 130339, 14050/6182, 030513/OCSPP/FT/MYSIDS. Unpublished study prepared by Smithers Viscient Laboratories. 77p.
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850.1075 Fish acute toxicity test, freshwater and marine

MRID	Citation Reference
	Freshwater Fish
49677735	Romine, J. (2013) XDE-848 Benzyl Ester: Acute Toxicity to the Rainbow Trout, Oncorhynchus mykiss, Determined Under Flow-Through Test Conditions. Project Number: 130413, 69710, 69698. Unpublished study prepared by ABC Laboratories, Inc. 77p.
49677736	Romine, J. (2013) XDE-848 Benzyl Ester: Acute Toxicity with the Fathead Minnow, Pimephales promelas, Determined Under Flow-Through Test Conditions. Project Number: 130415, 69711, 69698. Unpublished study prepared by ABC Laboratories, Inc. 75p.
49677738	Hadsell, R. (2014) X12393505 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Common Carp, Cyprinus carpio, Determined Under Static-Renewal Test Conditions. Project Number: 140550, 81026, 81027, 140546. Unpublished study prepared by ABC Laboratories, Inc. 60p.
49677739	Goudie, O. (2014) X12131932 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Common Carp, Cyprinus carpio, Determined Under Static-Renewal Test Conditions.

Project Number: 140551, 81169, 81168, 140547. Unpublished study prepared by ABC Laboratories, Inc. 60p.

49677740 Goudie, O. (2014) X11966341 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Common Carp, Cyprinus carpio, Determined Under Static-Renewal Test Conditions. Project Number: 140553, 81029, 81028, 140518. Unpublished study prepared by ABC Laboratories, Inc. 60p.

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49677743 Hoover, E. (2015) X12483137 (a **Metabolite** of XDE-848 BE): Acute Toxicity to the Common Carp, Cyprinus carpio, Determined Under Static-Renewal Test Conditions. Project Number: 150200, 82375, 82374, 150201. Unpublished study prepared by ABC Laboratories, Inc. 60p.

49678012 Tanneberger, C. (2015) **GF-3301**:Toxicity to the Carp Cyprinus carpio under Laboratory Conditions (Acute Toxicity Test-Semi-Static): Final Report. Project Number: 150634, GF/3301, S15/02831. Unpublished study prepared by Eurofins Agrosciences Services. 48p.

49677910 VanHooser, A. (2015) **GF-3206:** Acute Toxicity to the Common Carp, Cyprinus carpio, Determined Under Static-Renewal Test Conditions. Project Number: 140762, 81224, 140560. Unpublished study prepared by ABC Laboratories, Inc. 66p.

Estuarine Marine Fish

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850.1300 Daphnid chronic toxicity test

MRID	Citation Reference
49677744	Bergfield, A. (2014) XDE-848 Benzyl Ester: Chronic Toxicity Test with the Cladoceran, Daphnia magna, Exposed Under Static-Renewal Conditions. Project Number: 130421, 80315, 69698. Unpublished study prepared by ABC Laboratories, Inc. 89p.
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850.1350 Mysid chronic toxicity test

MRID	Citation Reference
49677746	Schwader, A. (2014) XDE-848 Benzyl Ester TGAI: Life-Cycle Toxicity Test with Mysids Americamysis bahia. Project Number: 130340, 14050/6184. Unpublished study prepared by Smithers Viscient. 116p. **Reproduction effected**

850.1400 Fish early-life stage toxicity test

MRID	Citation Reference
49677747	Romine, J. (2014) XDE-848 Benzyl Ester: Early Life-Stage Toxicity Test with the Fathead Minnow, Pimephales promelas, Under Flow-Through Conditions. Project Number: 130417, 80056, 69698. Unpublished study prepared by ABC Laboratories, Inc. 106p.
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850.1735 Whole sediment: acute freshwater invertebrates

MRID	Citation Reference
49677750	Lamichhane, K. (2015) XDE-848 Benzyl Ester: Whole Sediment Acute Toxicity Test with Midge Larvae (Chironomus dilutus). Project Number: 130434, 81228, 69698. Unpublished study prepared by ABC Laboratories, Inc. 95p. **Growth effected**

850.2100 Avian acute oral toxicity test

MRID	Citation Reference
49677751	Hubbard, P.; Beavers, J. (2013) X11959130 XDE-848 Benzyl Ester: An Acute Oral Toxicity Study with the Northern Bobwhite. Project Number: 130301, 379/328, STP634. Published study prepared by Wildlife International Ltd. 50p.
49677752	Hubbard, P.; Beavers, J. (2013) X11959130 XDE-848 Benzyl Ester: An Acute Oral Toxicity Study with the Zebra Finch. Project Number: 130313, 379/331, STP634. Published study prepared by Wildlife International Ltd. 55p.

850.2200 Avian dietary toxicity test

MRID	Citation Reference
49677753	Hubbard, P.; Martin, K.; Beavers, J. (2013) X11959130 XDE-848 Benzyl Ester: A Dietary LC50 Study with the Northern Bobwhite. Project Number: 130303, 379/329, STP634. Published study prepared by Wildlife International Ltd. 86p.
49677754	Hubbard, P.; Martin, K.; Beavers, J. (2013) X11959130 XDE-848 Benzyl Ester: A Dietary LC50 Study with the Mallard. Project Number: 130304, 379/330, STP634. Published study prepared by Wildlife International Ltd. 83p.

850.2300 Avian reproduction test

MRID	Citation Reference

49677755	Temple, D.; VanEvera, S.; Martin, K.; et al. (2014) X11959130 XDE-848 Benzyl Ester: A Reproduction Study with the Northern Bobwhite. Project Number: 130305, 379/332. Published study prepared by Wildlife International Ltd. 227p.
49677756	Temple, D.; VanEvera, S.; Martin, K.; et al. (2014) X11959130 XDE-848 Benzyl Ester: A Reproduction Study with the Mallard. Project Number: 130306, 379/333. Published study prepared by Wildlife International Ltd. 221p.

850.3020 Honey bee acute contact toxicity (and Oral-non-guideline)

MRID	Citation Reference
49677757	Schmitzer, S.; Haupt, S. (2013) XDE-848 **Benzyl Ester:** Acute **Contact and Oral** Effects on Honey Bees Apis mellifera L. in the Laboratory. Project Number: 130241, 130242, 82864035. Published study prepared by Institut fur Biologische Analytik und Consutling IBACON GmbH. 54p.

850.4100 Terrestrial plant toxicity, Tier 1 (seeding emergence)

MRID	Citation Reference
49677759	Bergfield, A. (2015) **GF-3206** XDE-848 Benzyl, 25 g a.s. L EC: Effects on the Seedling Emergence and Growth of Non-Target Terrestrial Plants Tier II. Project Number: 140396, 81366, 69698. Published study prepared by ABC Laboratories, Inc. 132p.
49677760	Lee, B. (2015) X11438848 **XDE-848 Acid**: Effects on the Seedling Emergence and Growth of Non-Target Terrestrial Plants Tier II. Project Number: 140778, 81367, 69698. Published study prepared by ABC Laboratories, Inc. 146p.
49677761	Stead, A. (2015) XDE-848-**benzyl primary metabolites** X12300837, X11966341, X12131932, X12393505, X12483137 GLP Seedling Emergence and Seedling Growth Test Terrestrial Non Target Plant Species based on EPA Ecological Effects Test Guidelines OCSPP 850.4100-2015. Project Number: 150162, STC/15/E945, UMK0119. Published study prepared by Stockbridge Technology Centre Ltd. 218p.

850.4150 Terrestrial plant toxicity, Tier 1 (vegetative vigor)

MRID	Citation Reference
49677762	Lee, B. (2015) **GF-3206** XDE-848 Benzyl, 25 g a.s. L, EC: Effects on the Vegetative Vigor of Non-Target Terrestrial Plants Tier II. Project Number: 140394, 81295, 69698. Published study prepared by ABC Laboratories, Inc. 128p.
49677763	Bergfield, A. (2015) **X11438848 XDE-848 Acid:** Effects on the Vegetative Vigor of Non-Target Terrestrial Plants Tier II. Project Number: 140979, 81368, 69698. Published study prepared by ABC Laboratories, Inc. 114p.
49677764	Davies, C. (2016) XDE-848-benzyl primary metabolites X12300837, X11966341, X12131932, X12393505, X12483137 GLP Vegetative Vigour Test Terrestrial Non Target Plant Species: based on OECD Guideline 227 and EPA Ecological Effects Test Guidelines: OCSPP 850.4150 - 2015. Project Number: 150161, STC/15/E946, UMK0119. 200p.
49931707	Davies, C (2015) Amended Final Report No. 1: GF-3480 (XDE-848-benzyl + cyhalofop-butyl, 20 + 100 g a.s/L EC) GLP Vegetative Vigour Test Terrestrial Non

Target Plant Species (based on OECD Guideline 227) – 2015: Stockbridge Technology Center, Lt., North Yorkshire, UK.

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850.4400 Aquatic plant toxicity test using Lemna spp. Tiers I and II

MRID	Citation Reference
49677765	Rebstock, M. (2013) XDE-848 Benzyl Ester: Growth Inhibition Test with the Freshwater Aquatic Plant, Duckweed, Lemna gibba. Project Number: 130432, 69715, 69698. Published study prepared by ABC Laboratories, Inc. 92p.
49677911	Mays, C. (2015) **GF-3206**: Growth Inhibition Test with the Freshwater Aquatic Plant, Duckweed, Lemna gibba. Project Number: 150487, 82372, 69698. Unpublished study prepared by ABC Laboratories, Inc. 84p.

850.4500 Algal Toxicity

MRID	Citation Reference
49677766	Rebstock, M. (2013) XDE-848 **Benzyl Ester**: Growth Inhibition Test with the Marine Diatom, Skeletonema costatum. Project Number: 130428, 69708, 69698. Published study prepared by ABC Laboratories, Inc. 89p. **96 hour test**
49677767	Taylor, M. (2013) XDE-848 **Benzyl Ester**: Growth Inhibition Test with the Unicellular Freshwater Diatom, Navicula pelliculosa. Project Number: 130427, 69706, 69698. Published study prepared by ABC Laboratories, Inc. 102p. **96 hour test**
49677768	Stadler, T. (2013) XDE-848 **Benzyl Ester**: Growth Inhibition Test with the Unicellular Green Alga, Pseudokirchneriella subcapitata. Project Number: 130435, 69705, 69698. Published study prepared by ABC Laboratories, Inc. 99p. **96 hour test**
49677769	Stadler, T. (2013) X11438848 **XDE-848 Acid**: Growth Inhibition Test with the Unicellular Green Alga, Pseudokirchneriella subcapitata. Project Number: 130426, 69844, 69698. Published studied prepared by ABC Laboratories, Inc. 84p.
49677770	Hicks, S. (2014) X11966341 a **Metabolite** of XDE-848 BE: Growth Inhibition Test with the Freshwater Diatom, Navicula pelliculosa. Project Number: 140552, 81025. Published study prepared by ABC Laboratories, Inc. 84p.
49677771	Hicks, S. (2015) X12393505 a **Metabolite** of XDE-848 BE: Growth Inhibition Test with the Freshwater Diatom, Navicula pelliculosa. Project Number: 140548, 81024. Published study prepared by ABC Laboratories, Inc. 84p.
49677772	Hicks, S. (2015) X12483137 a **Metabolite** of XDE-848 BE: Growth Inhibition Test with the Freshwater Diatom, Navicula pelliculosa. Project Number: 150202, 82373. Published study prepared by ABC Laboratories, Inc. 83p.
49677773	Hicks, S. (2015) X12131932 a **Metabolite** of XDE-848 BE: Growth Inhibition Test with the Freshwater Diatom, Navicula pelliculosa. Project Number: 140549, 81167. Published study prepared by ABC Laboratories, Inc. 88p.

49677912	Aufderheide, J. (2015) **GF-3206:** Growth Inhibition Test with the Unicellular Green Alga, Pseudokirchneriella subcapitata. Project Number: 130425, 80087, 69698. Unpublished study prepared by ABC Laboratories, Inc. 101p. - **only 3% inhibition at 0.07, 18% inhibition at 1.1**
49678013	VanHooser, A. (2015) **GF-3301**: Growth Inhibition Test with the Unicellular Green Alga, Pseudokirchneriella subcapitata. Project Number: 150484, 82367. Unpublished study prepared by ABC Laboratories, Inc. 103p. **96 hour test - 20% reduction at 0.9 PPM**

850.4550 Cyanobacteria (Anabaena flos-aquae) Toxicity

MRID	Citation Reference
49677774	Rebstock, M. (2013) XDE-848 **Benzyl Ester**: Growth Inhibition Test with the Cyanobacterium, Anabaena flos-aquae. Project Number: 130429, 69707, 69698. Published study prepared by ABC Laboratories, Inc. 99p. **8% inhibition at 45 PPB**

OECD 239 Growth Inhibition Test

MRID	Citation Reference
49677805	Gonsior, G. 2015. XDE-848 Benzyl Ester: Growth Inhibition Test of *Myriophyllum spicatum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S12-04307. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 131279. Study initiated January 10 and completed March 3, 2014. 106 pp.
49677806	Gonsior, G. 2015. X11438848 (XDE-848 Acid): Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S12-04306. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 131277. Study initiated January 10 and completed February 5, 2014. 102 pp.
49677807	Gonsior, G. 2015. X12393505: Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-03288. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140544. Study initiated June 6 and completed July 5, 2014. 91 pp.
49677808	Gonsior, G. 2015. X12131932: Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-03287. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140545. Study initiated June 12 and completed July 4, 2014. 93 pp.
49677809	Gonsior, G. 2015. X11438848 (XDE-848 acid): Growth Inhibition of *Cabomba caroliniana* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-03685. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140797. Study initiated December 2 and completed March 18, 2015. 93 pp.
49677810	Gonsior, G. 2015. XDE-848 Benzyl Ester: Growth Inhibition of *Cabomba caroliniana* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-04425. Study sponsored by Dow

AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140795. Study initiated December 2 and completed March 27, 2015. 102 pp.

49677811 Gonsior, G. 2015. X11966341: Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-04544. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140966. Study initiated October 16 and completed November 26, 2014. 95 pp.

49677812 Gonsior, G. 2015. X12300837: Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-04545. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140967. Study initiated October 9 and completed November 12, 2014. 96 pp.

49677813 Gonsior, G. 2015. X12483137: Growth Inhibition of *Myriophyllum spicatum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S15-02554. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 150203. Study initiated April 8 and completed April 12, 2015. 95 pp.

49677814 Gonsior, G. 2015. X11438848 (XDE-848 acid): Growth Inhibition of *Ceratophyllum demersum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-03684. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140798. Study initiated December 16, 2014 and completed January 24, 2015. 91 pp.

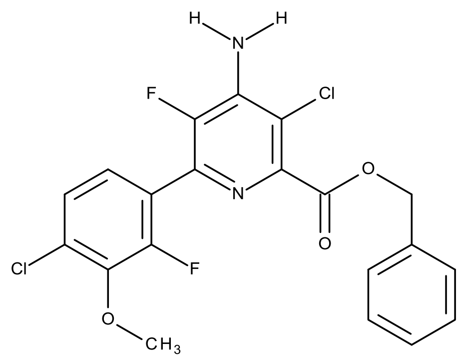
49677815 Gonsior, G. 2015. XDE-848 Benzyl Ester: Growth Inhibition of *Ceratophyllum demersum* in a Water/Sediment System. Study performed by Eurofins Agroscience Services, Niefer-Öschellbronn, Germany. Study code. S14-04424. Study sponsored by Dow AgroSciences LLC, Indianapolis, Indiana USA. DAS Study No. 140796. Study initiated December 16, 2014 and completed February 1, 2015. 107 pp.

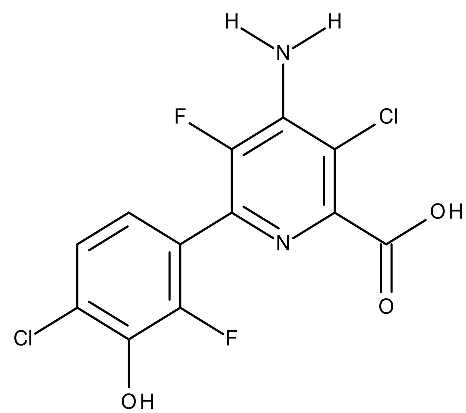
Non-Guideline Study Selections

MRID Reported Result	Citation Reference
49677758	Ganmann, M. (2013) X11959130 XDE-848 Benzyl Ester: Acute Toxicity 14 Days to the Earthworm Eisenia fetida in Artificial Soil with 10 Peat. Project Number: 130250, 82861021. Published study prepared by Institut fir Biologische Analytik und Consulting IBACON GmbH. 42p.
49677804	Dinehart, S. 2015. XDE-848 Benzyl Ester: Chronic Toxicity in Whole Sediment to Freshwater Midge, *Chironomus riparius,* Using Spiked Water **28 Day study**

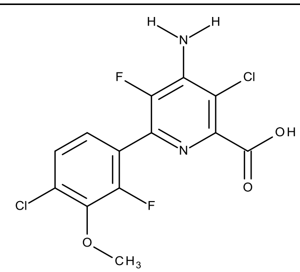
Appendix I. Florpyrauxifen-benzyl Degradate Profile

Table I-1. XDE-848 Benzyl Ester (Rinskor™) and Its Environmental Transformation Products [A]

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)	Final %AR (study length)
PARENT						
XDE-848 Benzyl Ester (Florpyrauxifen-benzyl, Rinskor, XR-848-BE, XR-848 Benzyl, X11959130, TSN301734)	**IUPAC:** Benzyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carboxylate **Formula:** $C_{20}H_{14}Cl_2F_2N_2O_3$ **MW:** 439.24 g/mol **SMILES:** [H]N([H])c1c(c(nc(c1Cl)C(=O)OCc2ccccc2)c3ccc(c(c3F)OC)Cl)F		835.2120 Hydrolysis	49677711	PRT	PRT
			835.2240 Aqueous photolysis	49677712		
			835.2410 Soil photolysis	49677714		
			835.4100 Aerobic soil metabolism	49677715		
			835.4200 Anaerobic soil metabolism	49677718		
			835.4300 Aerobic aquatic metabolism	49677716 49677719		
			835.4400 Anaerobic aquatic metabolism	49677720		
			835.1230 Batch equilibrium	49677710		

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
			835.6200 Aquatic field dissipation	49677721			
				49677722			
				49677723			
			850.1730 Fish BCF	49677749			
MAJOR (>10%) TRANSFORMATION PRODUCTS							
Hydroxy acid (XDE-848 hydroxy acid, XR-848 hydroxy acid, X11966341, TSN301668, TSN305649, TSN306022, OHA)	**IUPAC:** 4-Amino-3-chloro-6-(4-chloro-2-fluoro-3-hydroxy-phenyl)-5-fluoro-pyridine-2-carboxylic acid **Formula:** $C_{12}H_6Cl_2F_2N_2O_3$ **MW:** 335.09 g/mol **SMILES:** [H]N([H])c1c(c(nc(c1Cl)C(=O)O)c2ccc(c(c2F)O)Cl)F		835.4100 Aerobic soil metabolism	49677715	California loam	3.30% (59 d)	3.11% (120 d)
					Germany Loam	7.80% (30 d)	1.41% (120 d)
					Silt loam	6.38% (30 d)	1.48% (120 d)
					Loamy sand	4.10% (45 d)	1.00% (120 d)
			835.4200 Anaerobic soil metabolism	49677718	Clay loam	**58.3%** (126 d)	**58.3%** (126 d)
					Loam	**64.4%** (106 d)	**63.0%** (126 d)
					Silt loam	**61.5%** (106 d)	**61.4%** (126 d)

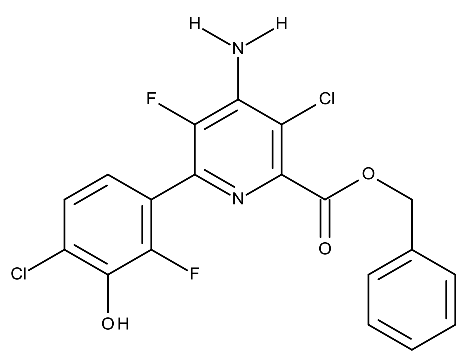
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)			Final %AR (study length)
					Sandy loam		**68.9%** (126 d)	**68.9%** (126 d)
			835.4300 Aerobic aquatic metabolism	49677716	Water:loam		**26.3%** (58 d)	**16.4%** (156 d)
					Water:sandy loam		**64.2%** (72 d)	**57.8%** (156 d)
				49677719	Lagoon water:loam		**75.2%** (31 d)	**47.2%** (105 d)
					Lake water:loamy sand		**78.3%** (59 d)	**44.8%** (105 d)
			835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand		**104.4%** (80 d)	**97.4%** (105 d)
					Pond water:silt loam		**100.0%** (13 d)	**94.3%** (105 d)
			835.6200 Aquatic field dissipation	49677721	California EC formulation	Soil	**34.7%** (3 d, 1st Appl)	0.8% (181 d)
						Water	0.1% (42 d, 2nd Appl)	NS (181 d)
					California Granular	Soil	**12.2%** (3 d, 2nd Appl)	1.0% (181 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)			Final %AR (study length)
					formulation	Water	0.2% (1 d, 1st Appl)	NS (181 d)
					Texas	Soil	**13.4%** (28 d, 2ndAppl)	0.0% (184 d)
						Water	0.1% (1, 3, 15 d, 2ndAppl)	NS (184 d)
				49677722	Florida	Water	6.8% (14 d)	0.0% (282 d)
					North Carolina	Sediment	0.37% (43 d)	Not analyzed (246 d)
						Water	2.7% (22 d)	0.0% (246 d)
				49677723	North Carolina	Sediment	1.72% (92 d)	0.0% (246 d)
						Water	3.7% (22 d)	0.0% (246 d)
XDE-848 acid (X11438848, TSN304667, TSN301691, 1552-A)	**IUPAC:** 4-Amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carboxylic acid **Formula:** $C_{13}H_8Cl_2F_2N_2O_3$ **MW:** 349.12 g/mol **SMILES:** [H]N([H])c1c(c(nc(c1Cl)C(=O)O)c2ccc(c(c2F)OC)Cl)F		835.2120 Hydrolysis	49677711	pH 7 (10°C)		1.7% (30 d)	1.7% (30 d)
					pH 9 (10°C)		**89.6%** (30 d)	**89.6%** (30 d)
					pH 4 (25°C)		2.9% (30 d)	2.9% (30 d)

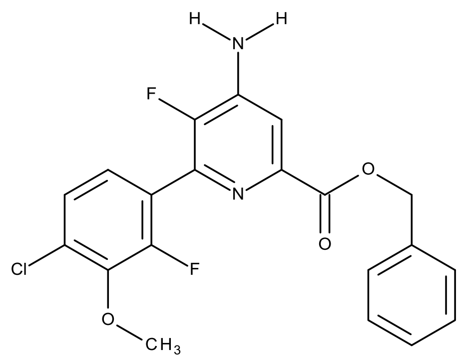
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
					pH 7 (25°C)	**16.6%** (30 d)	**16.6%** (30 d)
					pH 9 (25°C)	**98.5%** (30 d)	**98.5%** (30 d)
					pH 4 (35°C)	5.9% (22 d)	5.7% (30 d)
					pH 7 (35°C)	**41.1%** (30 d)	**41.1%** (30 d)
					pH 9 (35°C)	**99.5%** (30 d)	**99.5%** (30 d)
					pH 4 (50°C)	5.1% (5 d)	5.1% (5 d)
					pH 7 (50°C)	**46.6%** (5 d)	**46.6%** (5 d)
					pH 9 (50°C)	**98.6%** (5 d)	**98.6%** (5 d)
			835.2240 Aqueous photolysis	49677712	Natural water	8.9% (0.17 d)	0.8% (15.91 d)
			835.2410 Soil photolysis	49677714	Loam	7.0% (10 d)	6.7% (17 d)
			835.4100 Aerobic soil metabolism	49677715	California loam	**39.71%** (30 d)	**19.67%** (120 d)

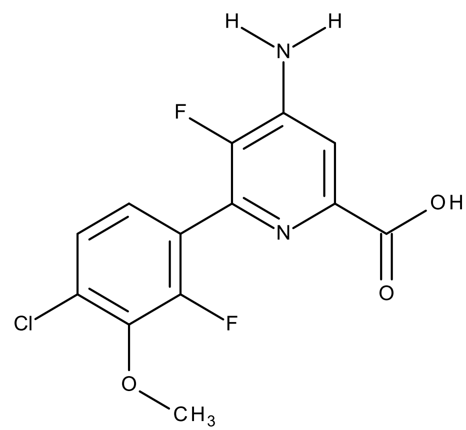
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
					Germany Loam	**32.95%** (9 d)	8.08% (120 d)
					Silt loam	**37.67%** (15 d)	**23.50%** (120 d)
					Loamy sand	**62.40%** (7 d)	5.66% (120 d)
			835.4200 Anaerobic soil metabolism	49677718	Clay loam	**61.3%** (26 d)	**22.2%** (126 d)
					Loam	**39.2%** (18 d)	3.1% (126 d)
					Silt loam	**25.2%** (18 d)	1.1% (126 d)
					Sandy loam	**73.5%** (26 d)	**16.8%** (126 d)
			835.4300 Aerobic aquatic metabolism	49677716	Water:loam	8.1% (6 d)	0.4% (156 d)
					Water:sandy loam	**33.1%** (20 d)	0.7% (156 d)
				49677719	Lagoon water:loam	**30.6%** (3 d)	1.6% (105 d)
					Lake water:loamy sand	**45.2%** (21 d)	1.2% (105 d)

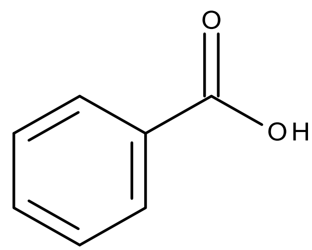
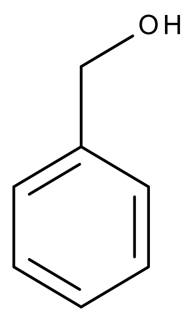
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)			Final %AR (study length)
			835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand		**27.9%** (7 d)	ND (105 d)
					Pond water:silt loam		**46.9%** (3 d)	ND (105 d)
			835.6200 Aquatic field dissipation	49677721	California EC formulation	Soil	**21.6%** (3 d, 1^{st} Appl)	0.9% (181 d)
						Water	3.9% (3 d, 1^{st} Appl)	NS (181 d)
					California Granular formulation	Soil	**6.8%** (3 d, 1^{st} Appl)	0.5% (181 d)
						Water	**13.7%** (1 d, 1^{st} Appl)	NS (181 d)
					Texas	Soil	**12.3%** (7 d, 1^{st} Appl)	0.0% (184 d)
						Water	6.6% (1 d, 2^{nd} Appl)	NS (184 d)
				49677722	Florida	Sediment	0.42% (14 d)	Not analyzed (282 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)			Final %AR (study length)
						Water	**17.4%** (14 d)	0.0% (282 d)
					North Carolina	Water	**33.0%** (14 d)	0.0% (246 d)
				49677723	North Carolina	Water	**35.2%** (22 d)	0.0% (246 d)
			850.1730 Fish BCF	49677749	NA			NA
Benzyl hydroxy (XDE-848 Hydroxy BE, X12300837, TSN302111, TSN305650, OHBE)	**IUPAC:** Benzyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-hydroxy-phenyl)-5-fluoro-pyridine-2-carboxylate **Formula:** $C_{19}H_{12}Cl_2F_2N_2O_3$ **MW:** 425.21 g/mol **SMILES:** [H]N([H])c1c(c(nc(c1Cl)C(=O)OCc2ccccc2)c3ccc(c(c3F)O)Cl)F		835.4100 Aerobic soil metabolism	49677715	California loam		2.45% (0 d)	1.11% (120 d)
					Germany Loam		2.49% (0 d)	0.74% (120 d)
					Silt loam		2.50% (0 d)	0.59% (120 d)
					Loamy sand		2.44% (0 d)	ND (120 d)
			835.4300 Aerobic aquatic metabolism	49677716	Water:loam		**15.9%** (30 d)	6.8% (156 d)
					Water:sandy loam		6.5% (20 d)	0.6% (156 d)

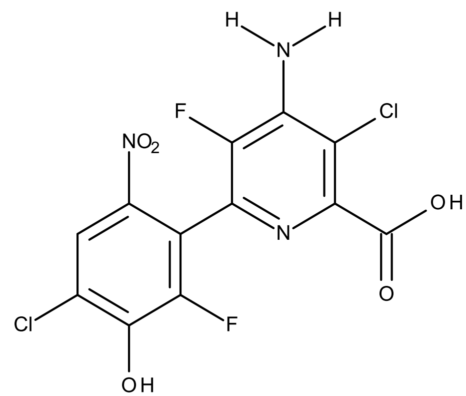
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)			Final %AR (study length)
				49677719	Lagoon water:loam		**22.8%** (7 d)	0.2% (105 d)
					Lake water:loamy sand		**13.2%** (14 d)	0.1% (105 d)
			835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand		**21.5%** (10 d)	ND (105 d)
					Pond water:silt loam		**43.1%** (10 d)	ND (105 d)
			835.6200 Aquatic field dissipation	49677721	California EC formulation	Soil	0.5% (3 d, 1st Appl)	0.0% (181 d)
					California Granular formulation	Soil	**10.0%** (14 d, 2nd Appl)	1.5% (181 d)
						Water	0.1% (1 d, 1st Appl)	NS (181 d)
					Texas	Water	0.1% (1 d, 2nd Appl)	NS (184 d)
				49677722	Florida	Water	1.5% (14 d)	0.0% (282 d)
					North Carolina	Sediment	0.18% (125 d)	Not analyzed (246 d)

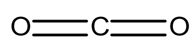
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)			Final %AR (study length)
						Water	0.3% (7 d)	0.0% (246 d)
				49677723	North Carolina	Sediment	0.52% (28 d)	0.0% (246 d)
						Water	0.5% (22 d)	0.0% (246 d)
Des-chloro XDE-848 Benzyl Ester (De-Chloro-BE, X12131932, TSN304946, DBE)	**IUPAC:** Benzyl 4-amino-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carboxylate **Formula:** $C_{20}H_{15}ClF_2N_2O_3$ **MW:** 404.79 g/mol **SMILES:** [H]N([H])c1cc(nc(c1F)c2ccc(c(c2F)OC)Cl)C(=O)OCc3ccccc3		835.2240 Aqueous photolysis	49677712	pH 4		**30.8%** (0.17 d)	ND (17.99 d)
					Natural water		**28.4%** (0.17 d)	ND (15.91 d)
			835.2410 Soil photolysis	49677714	Loam		3.4% (1 d)	2.9% (17 d)
			835.6200 Aquatic field dissipation	49677721	California EC formulation	Water	0.1% (0 d, 1st Appl)	NS (181 d)
					Texas	Water	0.1% (0 d, 2nd Appl)	NS (184 d)
				49677722	Florida	Water	0.2% (0.04, 0.25, 0.5 d)	0.0% (282 d)
					North Carolina	Sediment	0.29% (125 d)	Not analyzed (246 d)
						Water	0.1% (0.04, 0.25, 0.5, 1, 1.5 d)	0.0% (246 d)
				49677723	North Carolina	Water	0.2% (0.5, 1.5, 2 d)	0.0% (246 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)			Final %AR (study length)
Des-chloro XDE-848 acid (De-Chloro-Acid, X12393505, TSN304479, DA)	**IUPAC:** 4-Amino-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carboxylic acid **Formula:** $C_{13}H_9ClF_2N_2O_3$ **MW:** 314.67 g/mol **SMILES:** [H]N([H])c1cc(nc(c1F)c2ccc(c(c2F)OC)Cl)C(=O)O	 	835.2240 Aqueous photolysis	49677712	pH 4		**10.4%** (0.99 d)	ND (17.99 d)
					Natural water		8.4% (1.00 d)	2.4% (15.91 d)
			835.2410 Soil photolysis	49677714	Loam		2.8% (7 d)	2.1% (17 d)
			835.6200 Aquatic field dissipation	49677721	California EC formulation	Water	0.2% (3 d, 1st Appl)	NS (181 d)
					California Granular formulation	Water	0.4% (1 d, 1st Appl)	NS (181 d)
					Texas	Water	0.1% (1-7 d, 2nd Appl)	NS (184 d)
				49677722	Florida	Water	0.2% (1.5, 3, 8 d)	0.0% (282 d)
					North Carolina	Water	0.2% (3, 7 d)	0.0% (246 d)
				49677723	North Carolina	Water	0.2% (7, 14, 22 d)	0.0% (246 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
			850.1730 Fish BCF	49677749	NA		NA
Benzoic acid (X194973)	**IUPAC:** Benzoic acid **Formula:** $C_7H_6O_2$ **MW:** 122.12 g/mol **SMILES:** c1ccc(cc1)C(=O)O		835.4300 Aerobic aquatic metabolism	49677719	Lagoon water:loam	**21.3%** (10 d)	ND (105 d)
					Lake water:loamy sand	**10.7%** (14 d)	ND (105 d)
			835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand	7.4% (7 d)	ND (105 d)
					Pond water:silt loam	**20.2%** (10 d)	ND (105 d)
Benzyl alcohol (Phenyl methanol, X195023, TSN305834)	**IUPAC:** Benzyl alcohol **Formula:** C_7H_8O **MW:** 108.14 g/mol **SMILES:** c1ccc(cc1)CO		835.2120 Hydrolysis	49677711	pH 7 (10°C)	2.7% (30 d)	2.7% (30 d)
					pH 9 (10°C)	**90.7%** (30 d)	**90.7%** (30 d)
					pH 4 (25°C)	2.0% (30 d)	2.0% (30 d)
					pH 7 (25°C)	**20.1%** (30 d)	**20.1%** (30 d)

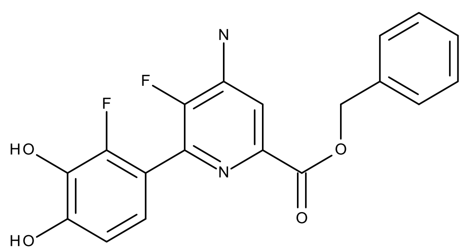
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
					pH 9 (25°C)	**100.0%** (30 d)	**100.0%** (30 d)
					pH 4 (35°C)	5.3% (30 d)	5.3% (30 d)
					pH 7 (35°C)	**51.5%** (30 d)	**51.5%** (30 d)
					pH 9 (35°C)	**100.0%** (30 d)	**100.0%** (30 d)
			835.2240 Aqueous photolysis	49677712	pH 4	**67.5%** (7.01 d)	**59.7%** (17.93 d)
					Natural water	**81.5%** (6.90 d)	**75.7%** (15.88 d)
			835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand	8.2% (7 d)	ND (105 d)
X12483137 (TSN307911, Nitro Hydroxy Acid)	**IUPAC:** 4-Amino-3-chloro-6-(4-chloro-2-fluoro-3-hydroxy-6-nitro-phenyl)-5-fluoro-pyridine-2-carboxylic acid **Formula:** $C_{12}H_5Cl_2F_2N_3O_5$ **MW:** 380.09 g/mol **SMILES:** [H]N([H])c1c(c(nc(c1Cl)C(=O)O)c2c(cc(c(c2F)O)Cl)[N+](=O)[O-])F		835.4100 Aerobic soil metabolism	49677715	California loam	8.26% (120 d)	8.26% (120 d)
					Germany Loam	8.33% (120 d)	8.33% (120 d)

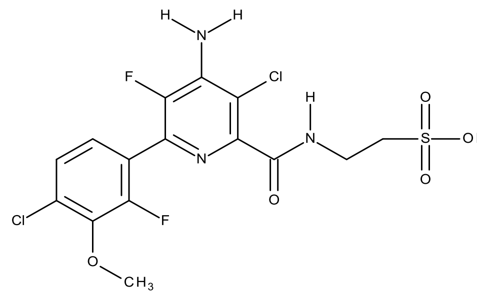
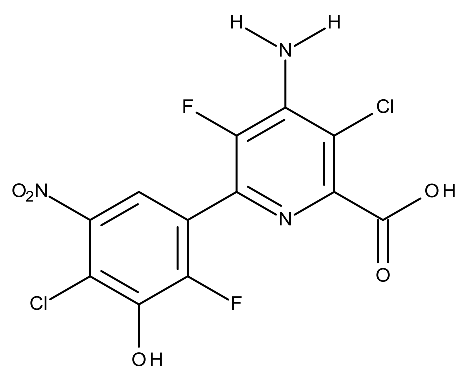
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
					Silt loam	**11.14%** (80 d)	**10.18%** (120 d)
Unknown (Rt 12:20-12:40)	NA	Structure not provided	835.2240 Aqueous photolysis	49677712	pH 4	**13.0%** (1.08, 2.01 d)	8.0% (17.93 d)
Unknown (Rt 22:50-23:00)	NA	Structure not provided	835.2240 Aqueous photolysis	49677712	pH 4	**12.7%** (4.01 d)	8.8% (17.93 d)
Unknown M7	NA	Structure not provided	835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand	**9.6%** (0.33 d)	ND (105 d)

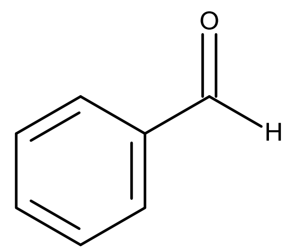
Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
Unknown M10	NA	Structure not provided	835.4400 Anaerobic aquatic metabolism	49677720	Pond water:silt loam	**12.9%** (10 d)	ND (105 d)
Carbon dioxide	**IUPAC:** Carbon dioxide **Formula:** CO_2 **MW:** 44 g/mol **SMILES:** C(=O)=O		835.2240 Aqueous photolysis	49677712	pH 4	**44.0%** (17.99 d)	**44.0%** (17.99 d)
					Natural water	**37.5%** (15.91 d)	**37.5%** (15.91 d)
			835.2410 Soil photolysis	49677714	Loam	**13.2%** (17 d)	**13.2%** (17 d)
			835.4100 Aerobic soil metabolism	49677715	California loam	**46.58%** (120 d)	**46.58%** (120 d)
					Germany Loam	**59.13%** (120 d)	**59.13%** (120 d)
					Silt loam	**64.06%** (120 d)	**64.06%** (120 d)
					Loamy sand	**64.25%** (120 d)	**64.25%** (120 d)
			835.4200 Anaerobic soil metabolism	49677718	Clay loam	**47.2%** (106 d)	**14.5%** (126 d)
					Loam	**41.0%** (126 d)	**41.0%** (126 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
					Silt loam	**45.8%** (126 d)	**45.8%** (126 d)
					Sandy loam	**45.0%** (106 d)	**44.4%** (126 d)
			835.4300 Aerobic aquatic metabolism	49677716	Water:loam	**37.6%** (156 d)	**37.6%** (156 d)
					Water:sandy loam	**71.5%** (156 d)	**71.5%** (156 d)
				49677719	Lagoon water:loam	**67.34%** (105 d)	**67.34%** (105 d)
					Lake water:loamy sand	**80.67%** (91 d)	**75.61%** (105 d)
			835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand	**49.1%** (105 d)	**49.1%** (105 d)
					Pond water:silt loam	**55.1%** (82 d)	**52.5%** (105 d)
Unextracted residues	NA	NA	835.2410 Soil photolysis	49677714	Loam	**15.3%** (17 d)	**15.3%** (17 d)
			835.4100 Aerobic soil metabolism	49677715	California loam	**32.92%** (120 d)	**32.92%** (120 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
					Germany Loam	**56.84%** (120 d)	**56.84%** (120 d)
					Silt loam	**53.09%** (80 d)	**52.69%** (120 d)
					Loamy sand	**80.58%** (120 d)	**80.58%** (120 d)
			835.4200 Anaerobic soil metabolism	49677718	Clay loam	**19.9%** (18 d)	9.2% (126 d)
					Loam	**40.0%** (81 d)	**23.9%** (126 d)
					Silt loam	**31.3%** (81 d)	**29.4%** (126 d)
					Sandy loam	**35.0%** (12 d)	**24.0%** (126 d)
			835.4300 Aerobic aquatic metabolism	49677716	Water:loam	**61.0%** (156 d)	**61.0%** (156 d)
					Water:sandy loam	**36.3%** (93 d)	**33.1%** (156 d)
				49677719	Lagoon water:loam	**42.12%** (105 d)	**42.12%** (105 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)		Final %AR (study length)
					Lake water:loamy sand	**44.27%** (91 d)	**38.93%** (105 d)
			835.4400 Anaerobic aquatic metabolism	49677720	River water:loamy sand	**12.8%** (3, 10 d)	8.8% (105 d)
					Pond water:silt loam	**11.8%** (41 d)	**9.9%** (105 d)
MINOR (<10%) TRANSFORMATION PRODUCTS							
X12421263 (TSN305953)	**IUPAC:** Benzyl 4-amino-5-fluoro-6-(2-fluoro-3,4-dihydroxy-phenyl)pyridine-2-carboxylate **Formula:** $C_{19}H_{14}F_2N_2O_4$ **MW:** 372.32 g/mol **SMILES:** c1ccc(cc1)COC(=O)c2cc(c(c(n2)c3ccc(c(c3F)O)O)F)N		835.2240 Aqueous photolysis	49677712	pH 4	6.1% (0.17 d)	ND (17.99 d)

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)	Final %AR (study length)
Taurine conjugate of XDE-848 acid (Taurine conjugate of X11433848)	**IUPAC:** 2-[[4-Amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxy-phenyl)-5-fluoro-pyridine-2-carbonyl]amino]ethanesulfonic acid **Formula:** $C_{15}H_{13}Cl_2F_2N_3O_5S$ **MW:** 456.25 g/mol **SMILES:** [H]N([H])c1c(c(nc(c1Cl)C(=O)N([H])CCS(=O)(=O)O)c2ccc(c(c2F)OC)Cl)F		850.1730 Fish BCF	49677749	NA	NA
REFERENCE COMPOUNDS NOT IDENTIFIED						
YC7-146847-39	**IUPAC:** 4-Amino-3-chloro-6-(4-chloro-2-fluoro-3-hydroxy-5-nitro-phenyl)-5-fluoro-pyridine-2-carboxylic acid **Formula:** $C_{12}H_5Cl_2F_2N_3O_5$ **MW:** 380.09 g/mol **SMILES:** [H]N([H])c1c(c(nc(c1Cl)C(=O)O)c2cc(c(c(c2F)O)Cl)[N+](=O)[O-])F		835.4100 Aerobic soil metabolism	49677715	NA	NA

Code Name/ Synonym	Chemical Name	Chemical Structure	Study Type	MRID	Maximum %AR (day)	Final %AR (study length)
Benzaldehyde	**IUPAC:** Benzaldehyde **Formula:** C_7H_6O **MW:** 106.12 g/mol **SMILES:** [H]C(=O)c1ccccc1		835.4400 Anaerobic aquatic metabolism	49677720	NA	NA

[A] AR means "applied radioactivity". MW means "molecular weight". PRT means "parent". ND means "not detected". NA means "not applicable". EC means "emulsifiable concentrate". Appl means "Application". BCF means "bioconcentration factor". NS means "no sample".

Appendix J. SIP and STIR Output Files

SIP

Table 1. Inputs

Parameter	**Value**
Chemical name	Florpyrauxifen-benzyl
Solubility (in water at 25°C; mg/L)	0.015
Mammalian LD_{50} (mg/kg-bw)	5000
Mammalian test species	laboratory rat
Body weight (g) of "other" mammalian species	
Mammalian NOAEL (mg/kg-bw)	300
Mammalian test species	laboratory rat
Body weight (g) of "other" mammalian species	
Avian LD_{50} (mg/kg-bw)	2250
Avian test species	northern bobwhite quail
Body weight (g) of "other" avian species	
Mineau scaling factor	1.15
Mallard NOAEC (mg/kg-diet)	
Bobwhite quail NOAEC (mg/kg-diet)	398
NOAEC (mg/kg-diet) for other bird species	
Body weight (g) of other avian species	
NOAEC (mg/kg-diet) for 2nd other bird species	
Body weight (g) of 2nd other avian species	

Table 2. Mammalian Results

Parameter	**Acute**	**Chronic**
Upper bound exposure (mg/kg-bw)	0.0026	0.0026
Adjusted toxicity value (mg/kg-bw)	3845.8028	230.7482
Ratio of exposure to toxicity	0.0000	0.0000
Conclusion*	**Drinking water exposure alone is NOT a potential concern for mammals**	**Drinking water exposure alone is NOT a potential concern for mammals**

Table 3. Avian Results

Parameter	Acute	Chronic
Upper bound exposure (mg/kg-bw)	0.0122	0.0122
Adjusted toxicity value (mg/kg-bw)	1620.9664	42.3067
Ratio of exposure to acute toxicity	0.0000	0.0003
Conclusion*	**Drinking water exposure alone is NOT a potential concern for birds**	**Drinking water exposure alone is NOT a potential concern for birds**

STIR

# Input	
Application and Chemical Information	
Enter Chemical Name	Florpyrauxifen
Enter Chemical Use	Aquatics foliar
Is the Application a Spray? (enter y or n)	y
If Spray What Type (enter ground or air)	air
Enter Chemical Molecular Weight (g/mole)	439.2
Enter Chemical Vapor Pressure (mmHg)	3.50E-07
Enter Application Rate (lb a.i./acre)	0.0527
Toxicity Properties	
Bird	
Enter Lowest Bird Oral LD_{50} (mg/kg bw)	2250
Enter Mineau Scaling Factor	1.15
Enter Tested Bird Weight (kg)	0.178
Mammal	
Enter Lowest Rat Oral LD_{50} (mg/kg bw)	5000
Enter Lowest Rat Inhalation LC_{50} (mg/L)	5.23
Duration of Rat Inhalation Study (hrs)	4
Enter Rat Weight (kg)	0.35

# Output		
Results Avian (0.020 kg)		
Maximum Vapor Concentration in Air at Saturation (mg/m^3)	8.27E-03	
Maximum 1-hour Vapor Inhalation Dose (mg/kg)	1.04E-03	
Adjusted Inhalation LD_{50}	1.31E+01	
Ratio of Vapor Dose to Adjusted Inhalation LD_{50}	7.92E-05	**Exposure not Likely Significant**

Maximum Post-treatment Spray Inhalation Dose (mg/kg)	5.06E-03	
Ratio of Droplet Inhalation Dose to Adjusted Inhalation LD_{50}	3.86E-04	**Exposure not Likely Significant**
Results Mammalian (0.015 kg)		
Maximum Vapor Concentration in Air at Saturation (mg/m^3)	8.27E-03	
Maximum 1-hour Vapor Inhalation Dose (mg/kg)	1.31E-03	
Adjusted Inhalation LD_{50}	3.11E+02	
Ratio of Vapor Dose to Adjusted Inhalation LD_{50}	4.20E-06	**Exposure not Likely Significant**
Maximum Post-treatment Spray Inhalation Dose (mg/kg)	6.36E-03	
Ratio of Droplet Inhalation Dose to Adjusted Inhalation LD_{50}	2.04E-05	**Exposure not Likely Significant**

Appendix K. Ecological Effect Data - Complete Terrestrial Plant Results

MRID # 49677759 - 21-Day Seedling Emergence study using GF-3206 (lbs ai/A).

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot[a]	Survival	0.0013	0.002541
Cucumber[b]	None	0.000035	>0.065
Oilseed rape	Dry weight	0.0034	0.0226
Soybean	Dry weight	0.026	0.063
Sugar beet	None	0.065	>0.065
Sunflower	Dry weight	0.065	>0.065
Corn	Dry weight	0.065	>0.065
Oat	None	0.065	>0.065
Onion	Dry weight	0.0034	0.00617
Ryegrass	Dry weight	0.065	>0.065

[a] Studies are designed to capture sub-lethal effects, therefore survival is not expected to be the most sensitive endpoint. The low survival may have confounded growth effects.

[b] Significant decrease in cucumber emergence, inhibition of 12 and 10% at the 0.00022 and 0.010 lb ai/A treatments compared to the negative control were not dose-dependent. (Mann-Whitney U Two-Sample test, $p<0.05$).

MRID # 49677760 - 21-Day Seedling Emergence study using Florpyrauxifen-Acid (lbs ai/A).

Crop	Endpoints	NOAEC (EC_{05}/IC_{05})	EC_{25}/IC_{25}
Carrot[a]	Survival	0.00054	0.0009306
Cucumber	Dry weight	0.0034	0.0324
Oilseed rape	Dry weight	0.0013	0.00301
Soybean[a]	Survival	0.0034	0.008608
Sugar beet	Dry weight	0.0088	0.0191
Sunflower	Height	0.022	0.057
Corn	None	0.064	>0.064
Oat	None	0.064	>0.064
Onion[a]	Survival	(0.0002214)	0.01294
Ryegrass	Dry weight	0.023	0.0279

[a] Studies are designed to capture sub-lethal effects; therefore, survival is not expected to be the most sensitive endpoint. The low survival may have confounded growth effects.

MRID # 49677761 - 21-Day Seedling Emergence study using X12300837 (lbs ai/A) [Benzyl OH].

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot	Dry weight	0.090	>0.090
Cotton	None	0.090	>0.090
Cucumber	None	0.090	>0.090
Soybean	Dry weight	0.045	>0.045
Sunflower	None	0.090	>0.090
Carrot	None	0.090	>0.090
Cotton	None	0.090	>0.090
Cucumber	None	0.090	>0.090
Soybean	None	0.090	>0.090
Sunflower	None	0.090	>0.090

MRID # 49677761 - 21-Day Seedling Emergence study using X11966341 (lbs ai/A) [Hydroxy Acid].

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot	Survival	0.082	0.0688
Cotton	None	0.082	>0.082
Cucumber	None	0.022	NC
Soybean*	Dry weight	0.022	>0.082
Sunflower	None	0.082	>0.082
Carrot	None	0.082	>0.082
Cotton	None	0.082	>0.082
Cucumber	None	0.082	>0.082
Soybean	Dry weight	0.022	0.0723

Sunflower	Height	0.045	>0.082

MRID # 49677761 - 21-Day Seedling Emergence study using X12131932 (lbs ai/A) [Des Chloro BE Ester].

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot	None	0.056	>0.056
Cotton	None	0.056	>0.056
Cucumber	Height	0.056	>0.056
Soybean	None	0.056	>0.056
Sunflower	None	0.056	>0.056
Carrot	None	0.056	>0.056
Cotton	None	0.056	>0.056
Cucumber	None	0.056	>0.056
Soybean	None	0.056	>0.056
Sunflower	None	0.056	>0.056

MRID # 49677761 - 21-Day Seedling Emergence study using X12393505 (lbs ai/A) [Des Chloro Acid].

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot	Dry weight	0.047	>0.047
Cotton	None	0.047	>0.047
Cucumber	None	0.047	>0.047
Soybean	None	0.047	>0.047
Sunflower	Height	0.047	>0.047
Carrot	None	0.047	>0.047
Cotton	Height	0.047	>0.047
Cucumber	None	0.047	>0.047
Soybean	None	0.047	>0.047
Sunflower	None	0.047	>0.047

MRID # 49677761 - 21-Day Seedling Emergence study using X12483137 (lbs ai/A) [Nitro OH acid].

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot	None	0.089	>0.089
Cotton	None	0.089	>0.089
Cucumber	None	0.089	>0.089
Soybean	None	0.089	>0.089
Sunflower	None	0.089	>0.089
Carrot	None	0.089	>0.089
Cotton	None	0.089	>0.089
Cucumber	None	0.089	>0.089
Soybean	None	0.089	>0.089
Sunflower	None	0.089	>0.089

MRID # 49677762 - 21-Day Vegetative Vigor study using GF-3206 (lbs ai/A).

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot	Dry weight	0.000035	0.0000635
Cucumber	Height	0.000087	0.000215
Oilseed rape	Dry weight	0.011	0.0142
Soybean	Dry weight	0.000014	0.0000469
Sugar beet	Dry weight	0.00022	0.000511
Sunflower	Dry weight	0.000087	0.0000854
Corn	Dry weight	0.011	0.0153
Oat	None	0.063	>0.063
Onion	Dry weight	0.0034	0.00415
Ryegrass	Dry weight	<0.00054	0.00934

MRID # 49677763 - 21-Day Vegetative Vigor study using Florpyrauxifen-Acid (lbs ai/A).

Crop	Endpoints	NOAEC	EC_{25}/IC_{25}
Carrot	Dry weight	0.00022	0.000446

Cucumber	Height	0.0013	0.00163
Oilseed rape	Dry weight	0.0087	0.0253
Soybean	Dry weight	0.00022	0.000389
Sugar beet	Dry weight	0.0087	0.0207
Sunflower	Dry weight	0.0034	0.00665
Corn	None	0.059	>0.059
Oat	None	0.059	>0.059
Onion	Dry weight	0.023	0.0364
Ryegrass	None	0.059	>0.059

MRID # 49677764 - 21-Day Vegetative Vigor study using X12300837 (lbs ai/A) [Benzyl OH].

Species	Endpoint	NOEC	EC25/IC25
Carrot	None	0.090	>0.090
Cotton	None	0.090	>0.090
Cucumber	None	0.090	>0.090
Soybean	None	0.090	>0.090
Sunflower	None	0.090	>0.090

MRID # 49677764 - 21-Day Vegetative Vigor study using X11966341 (lbs ai/A) [Hydroxy Acid].

Species	Endpoint	NOEC	EC_{25}/IC_{25}
Carrot	None	0.082	>0.082
Cotton	None	0.082	>0.082
Cucumber	None	0.082	>0.082
Soybean*	Dry weight	0.022	0.0723
Sunflower*	Height	0.045	>0.082

MRID # 49677764 - 21-Day Vegetative Vigor study using X12131932 (lbs ai/A) [Des Chloro BE Ester].

Species	Endpoint	NOEC	EC_{25}/IC_{25}
Carrot	None	0.056	>0.056
Cotton	None	0.056	>0.056
Cucumber	None	0.056	>0.056
Soybean	None	0.056	>0.056
Sunflower	None	0.056	>0.056

MRID # 49677764 - 21-Day Vegetative Vigor study using X12393505 (lbs ai/A) [Des Chloro Acid].

Species	Endpoint	NOEC	EC_{25}/IC_{25}
Carrot	None	0.047	NC
Cotton**	Height	0.047	0.0474
Cucumber	None	0.047	NC
Soybean	None	0.047	NC
Sunflower	None	0.047	NC

**Effect was not considered a dose-response.

MRID # 49677764 - 21-Day Vegetative Vigor study using X12483137 (lbs ai/A) [Nitro OH acid].

Species	Endpoint	NOEC	EC_{25}/IC_{25}
Carrot	None	0.089	>0.089
Cotton	None	0.089	>0.089
Cucumber	None	0.089	>0.089
Soybean	None	0.089	>0.089
Sunflower	None	0.089	>0.089

Appendix L. Ecological Effect Data - Complete Submerged Aquatic Plant Results

MRID # 49677805 - Myriophyllum using Rinskor-TGAI

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [ng/L]	Yield (total shoot length in cm) [ng/L]
14-day EC50	164	54.7 [*16.2*]
95% Conf. Limits	126 - 217	43.1 – 68.1 [*11.0-23.9*]
14-day NOEC	9.54	9.54 [*4.83*]
14-day LOEC	30.5	30.5 [*13*]
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [ng/L]	Yield (fresh weight in g) [ng/L]
14-day EC50	154	56
95% Conf. Limits	121 - 200	43.8 – 70.4
14-day NOEC	9.54	9.54
14-day LOEC	30.5	30.5
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [ng/L]	Yield (fresh weight in g) [ng/L]
14-day EC50	298	159
95% Conf. Limits	220 - 428	122 - 213
14-day NOEC	9.54	9.54
14-day LOEC	30.5	30.5

MRID # 49677810 Cabomba using Rinskor-TGAI

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [ug/L]	Yield (total shoot length in cm) [ug/L]
21-day EC50	3.67	1.57
95% Conf. Limits	2.60 - 5.71	1.20 - 2.13
21-day NOEC	0.655	0.655
21-day LOEC	2.25	2.25
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
21-day EC50	>7.50	1.79
95% Conf. Limits	-	1.37 - 2.54
21-day NOEC	0.655	0.655
21-day LOEC	2.25	2.25
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
21-day EC50	>7.50	>7.50
95% Conf. Limits	-	-
21-day NOEC	7.50	7.50
21-day LOEC	n.d.	n.d.

MRID # 49677815 Cabomba using Rinskor-TGAI

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [ug/L]	Yield (total shoot length in cm) [ug/L]
21-day EC50	3.67	1.57
95% Conf. Limits	2.60 - 5.71	1.20 - 2.13
21-day NOEC	0.655	0.655
21-day LOEC	2.25	2.25
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
21-day EC50	>7.50	1.79
95% Conf. Limits	-	1.37 - 2.54
21-day NOEC	0.655	0.655
21-day LOEC	2.25	2.25
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
21-day EC50	>7.50	>7.50
95% Conf. Limits	-	-
21-day NOEC	7.50	7.50
21-day LOEC	n.d.	n.d.

MRID # 49677815 Ceratophyllum using Rinskor-TGAI

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [ug/L]	Yield (total shoot length in cm) [ug/L]
14-day EC50	24.9	11.6
95% Conf. Limits	18.0 - 38.9	9.07 - 15.2
14-day NOEC	1.42	1.42
14-day LOEC	3.71	3.71
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
14-day EC50	6.94	4.52
95% Conf. Limits	5.49 - 8.89	3.64 - 5.63
14-day NOEC	1.42	1.42
14-day LOEC	3.71	3.71
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
14-day EC50	>38.5	26.8
95% Conf. Limits	-	18.5 - 46.0
14-day NOEC	1.42	1.42
14-day LOEC	3.71	3.71

MRID # 49677806 Myriophyllum using Rinskor-Acid

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [ug/L]	Yield (total shoot length in cm) [ug/L]
14-day EC50	1.46	0.712 [0.497]
95% Conf. Limits	1.18 – 1.86	0.588 - 0.855
14-day NOEC	0.143	0.143 [0.115]
14-day LOEC	0.458	0.458 [NA}
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
14-day EC50	2.88	1.00
95% Conf. Limits	2.19 - 3.90	0.783-1.27
14-day NOEC	0.143	0.143
14-day LOEC	0.458	0.458
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
14-day EC50	4.05	2.14
95% Conf. Limits	3.21-5.25	1.73-2.65
14-day NOEC	0.458	0.458
14-day LOEC	1.46	1.46

MRID # 49677809 Cabomba using Rinskor-Acid

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [ug/L]	Yield (total shoot length in cm) [ug/L]
21-day EC50	>150	>150
95% Conf. Limits	-	-
21-day NOEC	14.6	150
21-day LOEC	46.9	n.d.
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
21-day EC50	>150	119
95% Conf. Limits	-	96.0 - 160
21-day NOEC	46.9	46.9
21-day LOEC	150	150
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
21-day EC50	>150	>150
95% Conf. Limits	-	-
21-day NOEC	150	150
21-day LOEC	n.d.	n.d.

MRID # 49677814 Ceratophyllum using Rinskor-Acid

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [ug/L]	Yield (total shoot length in cm) [ug/L]
14-day EC50	>150	>150
95% Conf. Limits	-	-
14-day NOEC	150	150
14-day LOEC	>150	>150
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
14-day EC50	137	47.5
95% Conf. Limits	79.7 - 293	32.3 -76.9
14-day NOEC	1.43	1.43
14-day LOEC	4.58	4.58
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [ug/L]	Yield (fresh weight in g) [ug/L]
14-day EC50	>150	>150
95% Conf. Limits	-	-
14-day NOEC	46.9	150
14-day LOEC	150	>150

MRID # 49677812 Myriophyllum using Rinskor Hydroxy Benzyl-Ester (X12300837)

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [mg/L]	Yield (total shoot length in cm) [mg/L]
14-day EC50	0.055	0.0271
95% Conf. Limits	0.044 - 0.0685	0.022 - 0.0330
14-day NOEC	0.00954	0.00954
14-day LOEC	0.0305	0.0305
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [mg/L]	Yield (fresh weight in g) [mg/L]
14-day EC50	0.0532	0.0256
95% Conf. Limits	0.0434 - 0.0651	0.0211 - 0.0308
14-day NOEC	0.00954	0.00954
14-day LOEC	0.0305	0.0305
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [mg/L]	Yield (dry weight in g) [mg/L]
14-day EC50	0.0366	0.0238
95% Conf. Limits	0.0308 - 0.0435	0.0200 - 0.0282
14-day NOEC	0.00954	0.00954
14-day LOEC	0.0305	0.0305

MRID # 49677811 Myriophyllum using Rinskor Hydroxy-Acid (X11966341)

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [mg/L]	Yield (total shoot length in cm) [mg/L]
14-day EC50	0.374	0.182
95% Conf. Limits	0.305 - 0.469	0.153 - 0.216
14-day NOEC	0.0305	0.0305
14-day LOEC	0.0977	0.0977
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [mg/L]	Yield (fresh weight in g) [mg/L]
14-day EC50	0.472	0.204
95% Conf. Limits	0.377 - 0.615	0.171 - 0.244
14-day NOEC	0.0977	0.0977
14-day LOEC	0.313	0.313
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [mg/L]	Yield (dry weight in g) [mg/L]
14-day EC50	0.516	0.247
95% Conf. Limits	0.403 - 0.695	0.201 - 0.307
14-day NOEC	0.0977	0.0977
14-day LOEC	0.313	0.313

MRID # 49677808 Myriophyllum using Rinskor De-Chloro BE (X12131932)

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [mg/L]	Yield (total shoot length in cm) [mg/L]
14-day EC50	0.649	0.296
95% Conf. Limits	0.511 - 0.879	0.248 - 0.356
14-day NOEC	0.0977	0.0977
14-day LOEC	0.313	0.313
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [mg/L]	Yield (fresh weight in g) [mg/L]
14-day EC50	0.621	0.291
95% Conf. Limits	0.472 - 0.884	0.238 - 0.360
14-day NOEC	0.0977	0.0305
14-day LOEC	0.313	0.0977
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [mg/L]	Yield (dry weight in g) [mg/L]
14-day EC50	>1.00	>1.00
95% Conf. Limits	-	-
14-day NOEC	0.0977	0.0977
14-day LOEC	0.313	0.313

MRID # 49677813 Myriophyllum using Rinskor Nitro-Hydroxy Acid (X12483137)

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [mg/L]	Yield (total shoot length in cm) [mg/L]
14-day EC50	11.1	6.35
95% Conf. Limits	9.06 - 13.6	5.20 - 7.70
14-day NOEC	0.954	0.954
14-day LOEC	3.05	3.05
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [mg/L]	Yield (fresh weight in g) [mg/L]
14-day EC50	19.3	9.45
95% Conf. Limits	15.4 - 24.4	7.68 - 11.6
14-day NOEC	0.954	0.954
14-day LOEC	3.05	3.05
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [mg/L]	Yield (dry weight in g) [mg/L]
14-day EC50	37.9	16.0
95% Conf. Limits	29.1 - 51.8	12.9 - 20.1
14-day NOEC	3.05	3.05
14-day LOEC	9.77	9.77

MRID # 49677807 Myriophyllum using Rinskor Des-Chloro-Acid (X12393505)

(a) total shoot length		
Parameter	Growth rate (total shoot length in cm) [mg/L]	Yield (total shoot length in cm) [mg/L]
14-day EC50	2.32	1.34
95% Conf. Limits	1.94 - 2.78	1.12 - 1.59
14-day NOEC	0.305	0.305
14-day LOEC	0.977	0.977
(b) fresh weight		
Parameter	Growth rate (fresh weight in g) [mg/L]	Yield (fresh weight in g) [mg/L]
14-day EC50	2.6	1.51
95% Conf. Limits	2.15 - 3.18	1.25 - 1.83
14-day NOEC	0.977	0.305
14-day LOEC	3.13	0.977
(c) dry weight		
Parameter	Growth rate (mean dry weight in g) [mg/L]	Yield (dry weight in g) [mg/L]
14-day EC50	7.08	4.75
95% Conf. Limits	5.26 - 10.5	3.65 - 6.58
14-day NOEC	0.977	0.977
14-day LOEC	3.13	3.13

Appendix M. ECOSAR Results for Florpyrauxifen-benzyl and its Degradates

ECOSAR (v1.11) was used to estimate the toxicity of the transformation products listed in **Table M-1** because study data were not available with which to evaluate their toxicity. ECOSAR predicts toxicity using a regression of the log K_{OW} and measured toxicity endpoints for a particular species and chemical class. ECOSAR is only used to prioritize the need for additional data on transformation products. As such, only degradates that are considered major (*i.e.*, >10% formation) were assessed with ECOSAR. Toxicity estimates are provided for each ECOSAR class, which range in the number, depending on the degradate. It is noted that due to the large number of degradates, each with a number of associated ECOSAR classes, that for each taxa only the estimate for the most sensitive ECOSAR class was populated into **Table M-1**, and denoted in brackets.

Table M-1. ECOSAR Toxicity Estimates for Florpyrauxifen Benzyl (XDE-848 Benzyl Ester) and Transformation Products [A]

Compound [Chemical Class][B]	Estimated Toxicity Value (mg/L)								
	96-hr FW fish LC_{50}	48-hr FW Daphnid LC_{50}	96-hr SW fish LC_{50}	96-hr FW Mysid LC_{50}	FW Fish NOAEC	FW Daphnid NOAEC	SW Fish NOAEC	SW Mysid NOAEC	96-hr EC_{50} Green Algae
XDE-848 BE, Florpyrauxifen Benzyl, X11959130 (Parent) [ECOSAR Class]	(>0.0414 to >3.2) 0.474* [Anilines]	(1.32) 0.500* [Neutral organics]	(0.040) 1.24* [Anilines unhindered]	(0.026) 0.271* [Esters]	(0.0373[C]) 0.002 [Halopyridines]	(0.0385[C]) 0.007 [Halopyridines]	0.306 [Esters]	(<0.0011) [No ECOSAR estimate]	(>0.0612; >2.12) 0.386* [Esters]
XDE-848 Acid X11438848 [ECOSAR Class]	(>99.4) 14.9 [Pyridine-alpha-acid]	(>91.8) 15.0 [Halopyridines-acid]			(29.8[C]) 0.542 [Anilines unhindered]	(25.9) 0.220 [Anilines unhindered]			23.4* [Anilines unhindered]
XDE-848 Benzyl Hydroxy, X12300837 [ECOSAR Class]	0.956 [Phenols]	0.670 [Phenol amines]	0.272 [Phenols]	0.761 [Esters]	0.005 [Anilines unhindered]	0.010 [Anilines unhindered]	0.590 [Esters]	0.354 [Phenols]	0.378 [Phenol amines]
Des-chloro XDE-848 BE, X12131932 [ECOSAR Class]	(>1.0) 1.23* [Anilines unhindered]	(>0.98) 1.65* [Neutral organics]	2.82* [Esters]	0.849 [Esters]	0.006 [Anilines unhindered]	0.010 [Anilines unhindered]	0.622 [Esters]	0.468 [Esters]	1.00* [Esters]
Des-chloro Acid X12393505 [ECOSAR Class]	(>90) 21.8 [Pyridine-alpha-acid]	(>110) 22.2 [Anilines unhindered-			0.804 [Anilines unhindered-acid]	0.243 [Anilines unhindered-acid]			25.0 [Anilines unhindered-acid]

Compound [Chemical Class][B]	Estimated Toxicity Value (mg/L)								
	96-hr FW fish LC_{50}	48-hr FW Daphnid LC_{50}	96-hr SW fish LC_{50}	96-hr FW Mysid LC_{50}	FW Fish NOAEC	FW Daphnid NOAEC	SW Fish NOAEC	SW Mysid NOAEC	96-hr EC_{50} Green Algae
		acid]							
Nitro hydroxy acid X12483137 [ECOSAR Class]	(>9.6) 21.5 [Pyridine-alpha-acid]	(>10) 13 [Phenol amines-acid]	63.8 [Phenols-acid]		0.775 [Anilines unhindered-acid]	0.268 [Anilines unhindered-acid]			21.8 [Phenol amines-acid]
Hydroxy acid X11966341 [ECOSAR Class]	(>120) 25.6 [Halopyridines-acid]	(>100) 13.8 [Phenol amines-acid]	121 [Phenols-acid]		1.31 [Anilines unhindered-acid]	0.309 [Anilines unhindered-acid]			29.8 [Phenol amines-acid]

[A] Toxicity values in parentheses were measured. All other toxicity values were estimated with ECOSAR (v1.0).
[B] Chemical class used by ECOSAR to predict toxicity.
[C] Highest tested concentration.
* Value exceeds the estimated limit of solubility.
**The toxicity value was estimated through application of an acute-to-chronic ratio.

Based on ECOSAR runs, it was found that the degradates benzoic acid and benzyl alcohol are much less toxic than the parent compound:

ECOSAR Run for Benzoic Acid

```
ECOSAR Version 1.11 Results Page

SMILES : O=C(O)c1ccccc1
CHEM   : Benzoic acid
CAS Num: 000065-85-0
ChemID1:
MOL FOR: C7 H6 O2
MOL WT : 122.12
Log Kow: 1.874      (EPISuite Kowwin v1.68 Estimate)
Log Kow:            (User Entered)
Log Kow: 1.87       (PhysProp DB exp value - for comparison only)
Melt Pt:            (User Entered for Wat Sol estimate)
Melt Pt: 122.40     (deg C, PhysProp DB exp value for Wat Sol est)
Wat Sol: 4009       (mg/L, EPISuite WSKowwin v1.43 Estimate)
Wat Sol:            (User Entered)
Wat Sol: 3400       (mg/L, PhysProp DB exp value)


--------------------------------------
Values used to Generate ECOSAR Profile
--------------------------------------
Log Kow: 1.874      (EPISuite Kowwin v1.68 Estimate)
Wat Sol: 3400       (mg/L, PhysProp DB exp value)



--------------------------------------
ECOSAR v1.11 Class-specific Estimations
--------------------------------------

 ******************************************************************************
 | Not Related to an Existing ECOSAR Class Definition                         |
 |                                                                            |
 | Estimates provided below use the Neutral Organics QSAR equations which     |
 | represent baseline toxicity potential (minimum toxicity) assuming a simple |
 | non-polar narcosis model.  Without empirical data on structurally similar  |
 | chemicals, it is uncertain if this substance will present significantly    |
 | higher toxicity above baseline estimates.                                  |
 ******************************************************************************

                                                                  Predicted
ECOSAR Class                  Organism           Duration  End Pt   mg/L (ppm)
===========================  ==================  ========  ======   ==========
--> Acid moeity found: Predicted values multiplied by 10

Neutral Organics-acid       : Fish               96-hr     LC50     1300.781
Neutral Organics-acid       : Daphnid            48-hr     LC50      730.075
Neutral Organics-acid       : Green Algae        96-hr     EC50      518.374
Neutral Organics-acid       : Fish                         ChV       125.419
Neutral Organics-acid       : Daphnid                      ChV        68.937
Neutral Organics-acid       : Green Algae                  ChV       132.290
Neutral Organics-acid       : Fish (SW)          96-hr     LC50     1636.355
Neutral Organics-acid       : Mysid              96-hr     LC50     1324.125
Neutral Organics-acid       : Fish (SW)                    ChV       164.501
Neutral Organics-acid       : Mysid (SW)                   ChV       118.794
Neutral Organics-acid       : Earthworm          14-day    LC50     2187.900
```

```
 Note:  * = asterisk designates: Chemical may not be soluble enough to
        measure this predicted effect. If the effect level exceeds the
        water solubility by 10X, typically no effects at saturation (NES)
        are reported.


------------------------------
Class Specific LogKow Cut-Offs
------------------------------
If the log Kow of the chemical is greater than the endpoint specific cut-offs
presented below, then no effects at saturation are expected for those endpoints.

Neutral Organics:
----------------
Maximum LogKow: 5.0 (Fish 96-hr LC50; Daphnid LC50, Mysid LC50)
Maximum LogKow: 6.0 (Earthworm LC50)
Maximum LogKow: 6.4 (Green Algae EC50)
Maximum LogKow: 8.0 (ChV)
```

ECOSAR Run for Benzyl Alcohol

```
ECOSAR Version 1.11 Results Page

SMILES : OCc(cccc1)c1
CHEM   : Benzenemethanol
CAS Num: 000100-51-6
ChemID1:
MOL FOR: C7 H8 O1
MOL WT : 108.14
Log Kow: 1.076      (EPISuite Kowwin v1.68 Estimate)
Log Kow:            (User Entered)
Log Kow: 1.10       (PhysProp DB exp value - for comparison only)
Melt Pt:            (User Entered for Wat Sol estimate)
Melt Pt: -15.20     (deg C, PhysProp DB exp value for Wat Sol est)
Wat Sol: 5.694E+004 (mg/L, EPISuite WSKowwin v1.43 Estimate)
Wat Sol:            (User Entered)
Wat Sol: 4.29E+004  (mg/L, PhysProp DB exp value)


--------------------------------------
Values used to Generate ECOSAR Profile
--------------------------------------
Log Kow: 1.076      (EPISuite Kowwin v1.68 Estimate)
Wat Sol: 4.29E+004  (mg/L, PhysProp DB exp value)



--------------------------------------
ECOSAR v1.11 Class-specific Estimations
--------------------------------------
Benzyl Alcohols
                                                                  Predicted
ECOSAR Class                 Organism           Duration  End Pt   mg/L (ppm)
===========================  ==================  ========  ======   ==========
Benzyl Alcohols            : Fish               96-hr     LC50      213.875
Benzyl Alcohols            : Daphnid            48-hr     LC50      157.779
Benzyl Alcohols            : Green Algae        96-hr     EC50       48.312
Benzyl Alcohols            : Fish                         ChV        15.538 !
Benzyl Alcohols            : Daphnid                      ChV        20.804 !
Benzyl Alcohols            : Green Algae                  ChV        19.094
```

```
===========================  ==================  ========  ======   ==========
Neutral Organic SAR         : Fish               96-hr     LC50      601.014
(Baseline Toxicity)         : Daphnid            48-hr     LC50      313.337
                            : Green Algae        96-hr     EC50      163.995
                            : Fish                         ChV        53.120
                            : Daphnid                      ChV        24.096
                            : Green Algae                  ChV        35.512

 Note:  * = asterisk designates: Chemical may not be soluble enough to
        measure this predicted effect. If the effect level exceeds the
        water solubility by 10X, typically no effects at saturation (NES)
        are reported.

 NOTE:  ! = exclamation designates: The toxicity value was estimated through
            application of acute-to-chronic ratios per methods outlined in
            the ECOSAR Methodology Document provided in the ECOSAR Help Menu.


------------------------------
Class Specific LogKow Cut-Offs
------------------------------
If the log Kow of the chemical is greater than the endpoint specific cut-offs
presented below, then no effects at saturation are expected for those endpoints.

Benzyl Alcohols:
---------------
Maximum LogKow: 5.8 (Fish LC50)
Maximum LogKow: 5.0 (Daphnid LC50)
Maximum LogKow: 6.4 (Green Algae EC50)
Maximum LogKow: 8.0 (Chronic Values)

Baseline Toxicity SAR Limitations:
---------------------------------
Maximum LogKow: 5.0 (Fish 96-hr LC50; Daphnid LC50)
Maximum LogKow: 6.4 (Green Algae EC50)
Maximum LogKow: 8.0 (ChV)
```