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SUBJECT: PROPANIL MITIGATION STATUS UPDATES

Background

Propanil is a broad-spectrum, contact, post-emergence herbicide that is applied as a broadcast spray by ground/aerial equipment. Propanil is the most widely used herbicide on California rice crops. The only approved use of propanil is for the agricultural control of broad-leafed weeds, grasses, and aquatic weeds in rice fields at both the state and federal level. There are currently 13 propanil products registered in California. The mode of action is disrupting photosynthesis in plants utilizing photosystem II (Pitts, 2022).

The Department of Pesticide Regulation (DPR) identified propanil as having a high-priority status for risk assessment due to studies revealing hematology toxicity in dogs and mice, testicular and liver tumors in rats and lymphoma in mice, and concern relating to residential bystander exposure to spray drift from applications. In addition, propanil has been identified as a potential groundwater contaminant. Other studies have addressed the potential for human health effects arising from exposure to propanil in food and drinking water, occupational activities, residential bystander exposure to spray drift, and aggregate risk for workers (i.e., handlers and fieldworkers).

Regulatory History and Status

United States Environmental Protection Agency (U.S EPA), Reregistration Eligibility Decision (RED)

In 2003, U.S. EPA completed an RED for propanil, which identified exposure risks of concern for occupational handlers for several aerial exposure scenarios. Even when maximum personal

protective equipment (PPE) was worn and engineering controls were in place, the risk was below the margin of exposure (MOE) of 300. At the time of the RED publication, U.S. EPA proposed implementing a suite of ten mitigation measures to reduce risk to agricultural workers and wildlife to acceptable levels. Propanil use in small grains was voluntarily cancelled and the only propanil turf product was cancelled due to non-payment of maintenance fees.

U.S. EPA, Propanil Human Health Draft Risk Assessment for Registration Review

In 2019, U.S. EPA released its Human Health Draft Risk Assessment for Registration Review. The Health Effects Division (HED) evaluated the hazard and exposure data and conducted dietary, occupational, residential, and aggregate exposure assessments to estimate risk to human health from current uses of propanil (McGovern et al, 2019). This draft risk assessment includes updates that were made since the last human health assessments were completed in 2003, as well as an addendum in 2011. The 2019 draft includes toxicity studies that were not previously available: acute neurotoxicity, subchronic inhalation, androgen receptor binding assay, and a targeted methemoglobin onset study. In addition, the draft assessment updated toxic points of departure, endpoints, levels of concern (LOCs), dietary exposure, and risk assessments, as well as exposure assessments of occupational handler, post-application, residential, aggregate, spray drift, and cumulative scenarios. HED identified no human health risks of concern resulting from dietary, aggregate, non-occupational spray drift at the edge of the field, or occupational exposures to propanil. The exposure profile—dermal and inhalation—are expected to include short-term (1-30 days) and intermediate-term (1 to 6 months) for agricultural occupational handlers and post-application workers. There were no residential exposure concerns. Exposures from non-occupational spray drift (dermal for adults and dermal and incidental oral for children) are expected to be short-term duration only and not of concern.

U.S. EPA, Proposed Interim Registration Review Decision (PID)

U.S. EPA's PID, published in June 2020, did not identify any human health risks of concern from dietary aggregate, non-occupational spray drift at the edge of the field, dermal exposures in bystanders, occupational handler, and post-application scenarios. Incidental oral risks were assessed with an LOC of 300. For occupational handler inhalation exposures, U.S. EPA used an LOC of 30 (U.S. EPA, 2020a). For all risk scenarios of exposure, the MOEs were above the LOC. Therefore, no occupational mitigation was proposed. In addition, U.S. EPA proposes to update language to standardized labels to reduce spray drift and lower risks to non-target plants and animals.

U.S. EPA, Interim Registration Review Decision (ID)

In December 2020, U.S. EPA published its ID, which describes information that had been updated since the Propanil PID was published. One update includes changes to the wind speed restriction to spray drift management language to improve clarity and consistency. Because there are no human health risk concerns from propanil, U.S. EPA is increasing the maximum wind

speed restriction from 10 miles per hour (mph) to 15 mph. U.S. EPA concludes that there are no updates to human health mitigation from the previous PID or any additional updates to draft risk assessments (U.S. EPA, 2020b).

DPR, Risk Characterization Document (RCD) for Propanil

In 2019, DPR published an RCD for propanil, which evaluated potential human health effects due to exposure to propanil in food and drinking water, from occupational activities, and from residential bystander exposure to spray drift. Aggregate risk was also evaluated for workers (i.e., handlers and fieldworkers) and residential bystanders. The RCD concluded that all acute, seasonal, and annual, as well as aggregate exposures for occupational handlers (pilots, mixers, loaders, applicators) and fieldworkers were of concern. Some of these exposures had MOEs as low as 1 with a target MOE of 300 (Lohstroh, 2019). While all dietary scenarios and most residential bystander scenarios exceeded the target MOE of 300, the following residential bystander spray drift exposure scenarios were of concern:

- Acute dermal exposures for adults and children (1-2 years old) for fixed-wing aerial applications at distances of ≤50 feet.
- Acute dermal exposures for adults and children (1-2 years old) for rotary aerial applications at distances of ≤50 feet and ≤25 feet, respectively.
- Aggregate exposures for females of childbearing age (13-50 years old) for fixed-wing and rotary aerial applications at distances of ≤50 feet and ≤25 feet, respectively.
- Aggregate exposures for children (1-2 years old) for fixed-wing and rotary aerial applications at distances of ≤100 feet and ≤50 feet, respectively.
- Aggregate exposures for children (1-2 years old) for ground boom applications at distances of ≤25 feet.

DPR, Propanil Mitigation Scoping Document

DPR's 2022 Mitigation Scoping Document for Propanil reviewed propanil risk assessment findings from U.S. EPA and DPR. The document reviewed all actively register labels, as well as current pesticide use data, sales data, illness data, and other pertinent information, to update data since the 2019 RCD was completed (Pitts, 2022). The scoping document highlighted exposure concerns from the RCD document for fieldworkers, handlers, and residential bystanders. In addition, it highlighted U.S. EPA's assessment of inhalation exposures for occupational handlers, which identified an LOC of 30.

Products and Formulations

Propanil is formulated as an aqueous concentrate (40.2-58.6% active ingredient (AI)), flowable concentrate (41.2% AI), and dry flowable concentrate (81% AI) (Pitts, 2022). In California,

propanil is formulated alone or with halosulfuron-methyl (0.46% AI). There are currently 7 registrants for 13 registered propanil products in California (DPR, 2025a) (Table 1).

Table 1. Registrants and all actively registered propanil-containing products in California

Registrant	Product Name	EPA Reg. #	Formulation	% AI	Formulation Classification
Makhteshim Agan of North America, Inc., D/B/A Adama	Diverge Silk	66222-286-AA	Aqueous Concentrate	40.20	Liquid
UPL NA Inc.	Stam 80 EDF-CA Herbicide	70506-375-AA	Soluble Powder	81.00	Solid
UPL NA Inc.	Superwham! CA	70506-359-AA	Flowable Concentrate	41.20	Liquid
Sharda USA LLC	Bengal	83529-255-AA	Emulsifiable Concentrate	41.20	Liquid
Solera ATO, LLC	Solanil 80WG	95172-3-AA-84237	Flowable (Dry)	81.00	Solid
Solera ATO, LLC	Solanil 80EDF Herbicide	70506-375-AA-84237	Flowable (Dry)	81.00	Solid
Solera ATO, LLC	Solanil 80EDF Herbicide	94123-2-AA-84237	Flowable (Dry)	81.00	Solid
Willowood, LLC	Willowood Propanil 4SC (CA)	87290-18-ZA	Aqueous Concentrate	41.40	Liquid
Willowood, LLC	Willowood Propanil 80CHS	87290-17-ZA	Flowable (Dry)	81.00	Liquid
Willowood, LLC	Willowood Propanil 4SC	87290-18-AA	Aqueous Concentrate	58.60	Liquid
Innvictis Crop Care, LLC	Virtue 4SC	89168-13-AA-89391	Aqueous Concentrate	58.60	Liquid
Prorice, LLC	Propanil 80 WG	95172-3-AA	Flowable (Dry)	81.00	Solid
Prorice, LLC	Proslam 4SC	95172-4-AA	Solution/Liquid (Ready-to-use)	41.60	Liquid

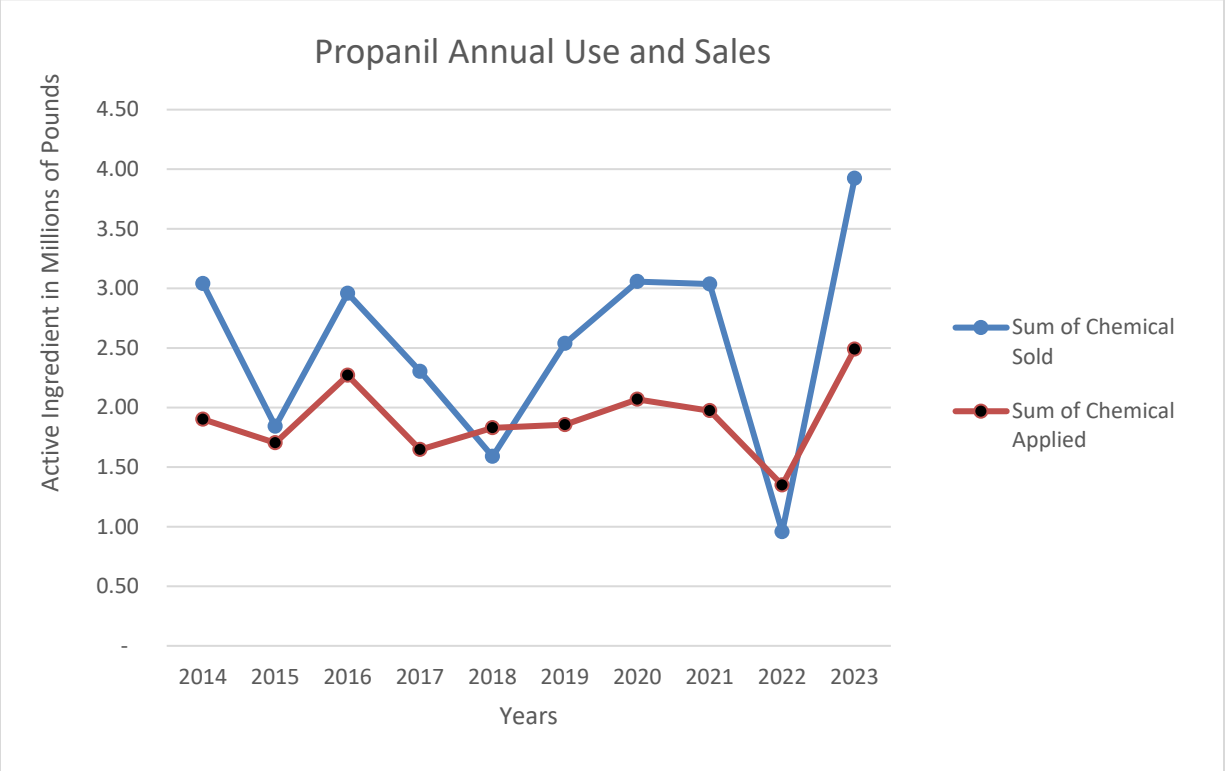
Pesticide Use and Sales

The only approved use for propanil in California is for weed control in agricultural rice production (Pitts, 2022). According to Pesticide Use Reporting (PUR) data from 2014 to 2023,

propanil use has been steady. In 2022, use decreased to 1.34 million pounds in 2022 and peaked again in 2023, at 2.48 million pounds, the highest use since 2014 (DPR, 2025b) (Figure 1).

According to the public records available through the Mill Assessment[1], propanil sales in California fluctuated between 2014 and 2023, but generally have stayed within 1.5 and 3.1 million pounds per year. In 2022, pounds of propanil sold decreased to its lowest level in the last 10 years (956,000 pounds). In 2023, propanil sales were the highest during the ten-year period (3.92 million pounds) (DPR, 2025c) (Figure 1).

Figure 1. Total annual use and sales (lbs. AI) of propanil in California from 2014 to 2023 (DPR, 2025b, DPR 2025c)



Pesticide Illnesses

From 1992 to 2022, DPR's Pesticide Illness Surveillance Program (PISP) reported one propanil exposure case. The incident occurred in 2007 in Sutter County and was characterized as "Probable". The PISP database defines a "case" as a representation of an individual's exposure to a pesticide that may or may not result in an illness and injury (DPR, 2025d). Pesticides involved

[1] The Mill Assessment is a self-reporting system based on monthly submitted sales data from registrants, pesticide brokers, and pest control dealers. Therefore, the data from the mill assessment may not align with pesticide use reporting.

in this incident were cyhalofop butyl, propanil, and triclopyr. The incident happened in an agricultural setting (rice) while the applicator applied herbicide to a rice field. As he returned to make his next pass, wind blew spray mist on his face. The applicator developed dizziness and nausea and was taken for medical care (DPR, 2025d).

DPR and U.S. EPA Risk Assessment Comparison

While DPR and U.S. EPA are harmonized in most of the risk assessments for propanil, including label information, restricted entry intervals (REIs), uses, formulations, and practices, the Agencies diverge on determination of toxicological endpoints and points of departure corresponding to human health risk estimates. According to U.S. EPA studies, the Agency did not identify occupational and bystander/residential risks of concern for dermal, inhalation, and oral exposures. However, DPR identified exposure risks of concern in occupational handler and fieldworker scenarios and certain spray drift exposure scenarios for residential bystanders.

DPR has established a target of MOE of 300, which includes an uncertainty factor of 10x for interspecies sensitivity, 10x for intraspecies variability, and 3x for the potential for enhanced sensitivity to metHb formation in human subpopulations with hereditary enzymatic deficiencies, as well as infants. U.S. EPA's Occupational Human Health Risk Assessment has established an MOE of 30, utilizing a 3X uncertainty factor for intraspecies and a 10X factor for interspecies for inhalation short-and intermediate-term occupational exposure. Based on the results of a chronic/carcinogenicity study, U.S. EPA adopted an LOC of 300 for incidental oral exposures. This included adding a 3-fold uncertainty factor to be adequate for the extrapolation of LOAL to NOAEL for this endpoint (McGovern et al, 2019). In addition, U.S. EPA has found no dermal exposure concerns based on a 21-day dermal toxicity study.

Conclusions

U.S. EPA's ID did not identify risks of concern for occupational handlers, occupational post-application exposures, bystander/residential exposures, aggregate exposures, or cumulative exposures (U.S. EPA, 2020b). However, DPR has identified the need for further mitigation to address exposures concerns for occupational handlers, applicators, mixers, loaders, and reentry workers, as well as certain residential bystander spray drift scenarios from fixed-wing and rotary aerial applications and ground boom applications.

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