**Propazine Executive Summary for Draft Biological Evaluation**

This Biological Evaluation (BE) assesses potential risks that registered uses of propazine (PC code 080808) may pose to an individual of a listed species or designated critical habitat. The federal action considered in this BE is the Registration Review for propazine. Registration Review encompasses the review of all the registered uses and the approved product labels for all pesticide products containing propazine, and any agreed upon changes to these labels from the technical registrants.

The term “listed species” includes those that are federally listed as endangered and threatened, as well as those that are proposed and candidates for listing and experimental populations. The methods employed in this BE follow the Revised Method for National Level Listed Species Biological Evaluations of Conventional Pesticides (referred to as the “Revised Method”)[[1]](#footnote-2). The Revised Method incorporates comments from the public, US Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS) and US Department of Agriculture (USDA).

As described in the Revised Method, EPA’s development of this BE includes two steps. The BE includes an evaluation of whether an individual of a listed species is reasonably expected to be exposed to a pesticide at a level that results in a discernable effect, and, if so, distinguishes effects that are likely to adversely affect an individual of a species from those that are not likely to adversely affect an individual. This process is also applied to the designated critical habitat of listed species (when available). In Step 1, for every listed species and designated critical habitat, EPA determines whether propazine will have No Effect (NE) or May Affect (MA) (separate determinations made for each species and critical habitat). For those species and critical habitats with MA determinations, in Step 2, EPA will determine if propazine is Not Likely to Adversely Affect (NLAA) or Likely to Adversely Affect (LAA) each individual species or critical habitat. Details on the method, models and tools used for making NE, NLAA and LAA determinations are provided in the Revised Method document.

# General Information

Propazine is a chlorotriazine herbicide registered in the U.S. to control annual broadleaf and grass weeds specifically in sorghum crops (also referred to as “milo”). Based on commitments from the technical registrant to change product labels, uses of propazine will only be allowed in Texas, Oklahoma and Kansas. Based on usage data compiled by EPA’s Office of Pesticide Program’s Biological and Economic Analysis Division (BEAD), approximately 218,400 pounds of propazine are used each year on 308,800 acres of sorghum in Oklahoma, Kansas and Texas (based on a yearly average from 2015 to 2017) (see **APPENDIX 1-4** for details).

This BE assesses all currently registered labels and any agreed upon changes to these labels from the registrants. While the current labels may not reflect all the agreed upon changes, the technical registrants have agreed in the form of commitment letters (see **APPENDIX 1-2**) to update the propazine formulated product labels to be reflective of the changes (uses summarized in **APPENDIX 1-3**). Major changes in the commitment letters include restriction of applications to Texas, Oklahoma and Kansas only, and implementation of new buffers and mandatory spray drift language (see **APPENDIX** 1-2 for specific details). Propazine may be applied by ground and aerial broadcast.

The major transport routes off the treated area for propazine include runoff and spray drift. Propazine is expected to be moderately persistent and mobile (according to the Food and Agricultural Organization (FAO) mobility classification system[[2]](#footnote-3)) in most soils, and it is resistant to breakdown by hydrolysis, photolysis, or biodegradation. Propazine is also fairly stable (e.g., half-lives on the order of months to years) under aerobic and anaerobic aquatic metabolism. The mobility of propazine is also noted in the supplemental terrestrial field dissipation studies, suggesting that propazine persists in the upper 6 inches and may leach to ground water. Therefore, the use of propazine may result in groundwater and/or surface water contamination in areas where soils are highly permeable, the water table is shallow, or where there is irrigation and/or high rainfall which promote runoff. Volatility and air photolysis are not expected to be major routes of dissipation due to the low vapor pressure (2.9 x 10-8 torr at 20 °C). Additional details on the fate of propazine are provided in **Chapter 3** of the Biological Evaluation. Residues of concern are discussed in **APPENDIX 1-8**.

Similar to the other chlorotriazine herbicides with current registrations in the United States (simazine and atrazine), propazine works by binding with a protein complex of the photosystem II in chloroplast photosynthetic membranes (Schulz *et al*., 1990). The result is an inhibition in the transfer of electrons through the light reactions of photosynthesis that in turn inhibits the formation and release of oxygen, production of adenosine triphosphate, and the fixation of carbon dioxide into sugars. Plant death results from starvation and oxidative damage caused by the breakdown in photosynthesis. The three chlorotriazines result in similar herbicidal effects to terrestrial and aquatic plants.

Propazine is practically non-toxic to animal taxa on an acute exposure basis. In most terrestrial animal species, sublethal effects are the predominant concern and are discussed further below. In both terrestrial and aquatic animals, propazine demonstrates a variety of growth and reproductive effects at a range of chronic exposure concentrations. Propazine has demonstrated adverse effects on growth to both vascular and non-vascular aquatic plants as well as terrestrial plants. There are no reliably reported ecological incidents involving propazine use for birds, mammals, fish, terrestrial invertebrates, and terrestrial plants. More details on the available toxicity data and incident reports are provided in **Chapter 2**.

# Exposure Methods

Exposure estimates are based primarily on fate and transport model results. Aquatic exposures (surface water and benthic sediment pore water) are quantitatively estimated for representative propazine uses in specific geographic regions within generic habitats (referred to as bins) using the Pesticide Root Zone Model (PRZM) and the Variable Volume Water Model (VVWM)[[3]](#footnote-4) in the Pesticides in Water Calculator (PWC). Aquatic exposure results for the bin(s) most appropriate for the species and/or critical habitat are discussed in **Chapter 3**. Also discussed in **Chapter 3** are available water monitoring data for propazine. For terrestrial exposures, existing models [*i.e.*, AgDRIFT, earthworm fugacity model, Terrestrial Herpetofaunal Exposure Residue Program Simulation (T-HERPS), Terrestrial Residue Exposure model (T-REX) and portions of the Terrestrial Investigation Model (TIM)] were combined and modified into a single tool that is referred to as the MAGTool (**Chapter 4**). This assessment replaces EPA’s TerrPlant model with the Plant Assessment Tool (PAT), the latter is a more refined exposure model for terrestrial, wetland and aquatic plants.

# Overlap Analyses

Step 1 of the BE involves an analysis of the potential overlap of the action area and individual species ranges and critical habitat. The action area was derived in ArcGIS 10.7 by combining the data layers representative of propazine uses and then buffering them out to the off-site transport distance estimated using the AgDRIFT model (**APPENDIX 1-6**). The overlaps of action area and individual species’ ranges or critical habitats were calculated. This analysis used spatial data of species’ ranges and critical habitats from the FWS and NMFS. In the contiguous United States (ConUS), agricultural potential use sites are represented using the USDA Crop Data Layer (CDL) (**APPENDIX 1-5**). Because the technical registrants of propazine have committed to limit use of propazine products to three states, spatial layers of use sites in AK, HI and the territories are not needed. All species or critical habitats with some overlap of the action area and their range or designated critical habitat, or with some overlap on species that the listed species depends on (**Chapter 4**) are assessed in the MAGTool to make LAA/NLAA determinations.

# Effects Determinations

This BE makes effects determinations (NE, NLAA or LAA) for 1795 listed species, and 792 designated critical habitats. For each species and designated critical habitat, the effects determination is based on the methodology detailed in **Chapter 1** and the Revised Method document[[4]](#footnote-5). NE determinations were made for 1636 species and 755 critical habitats because there was no overlap between the species range/critical habitat and the action area. Numerous NE determinations were made based on commitment letters submitted by the registrants **(APPENDIX 1-2)**, whichlimit the use of propazine to the states of Texas, Oklahoma, and Kansas and prevented exposure to a large number of species located outside of these States. MA determinations were made for 159 species and 37 critical habitats. All species and critical habitats with a MA determination progressed to the Step 2 analysis where an NLAA or LAA determination is made. NLAA determinations were made for 95 species and 23 critical habitats. LAA determinations were made for 64 species and 14 critical habitats. Specific species determinations are provided in **APPENDIX 4-1.**

The MAGTool estimates the number of individuals of a listed species that are potentially affected, incorporating the degree of overlap of a species range with potential use sites and associated usage data for a chemical (and associated off-site transport areas) into the effects determinations. Using the toxicity endpoints for each taxon (**Chapter 2**), the MAGTool utilizes probabilistic methods to assess the impact of various assumptions of toxicity and exposure on the likelihood that atrazine will adversely affect an individual of a given species. To help determine the potential for risk, the MAGtool incorporates many of EPA’s standard pesticide exposure models to estimate exposures to listed species and their prey, pollination, habitat and dispersal vectors (PPHD). Details on the individual effects determinations are found in **APPENDIX 4-1**. If the model estimates are not considered representative of the exposure of the species (due to an inconsistency in the exposure model and assessed species’ habitat), a qualitative analysis is conducted. In those cases, EPA makes either a LAA or a NLAA determination based on a qualitative weight of evidence. For each LAA determination, this assessment employs three categories (*i.e.,* strongest, moderate and weakest) to characterize the strength of the weight of evidence. Each species or critical habitat was assigned a weak, moderate or strong evidence in the LAA determination based on multiple factors, including: the impact of using less conservative assumptions in the analysis, the quality of the species range or usage data, impacts to both the species and prey, pollination, habitat, and dispersal (PPHD) as opposed to only one, the presence of reported incidents involpving the species taxa or PPHD taxa, the presence of monitoring data that exceeds endpoints, exposure only due to spray drift and the likelihood of drift into a species habitat (e.g., if the species inhabits forests).

Of the LAA determinations, 45% of species and 64% of critical habitats were considered to have strong evidence. Moderate evidence was found for 27% of species and 14% of critical habitat LAA determinations. Weakest evidence was found for 28% of species and 21% of critical habitat LAA determinations. LAA determinations were made for species across all taxa.For certain species and critical habitats, there were uncertainties in the propazine effects determinations based on the resolution of usage data and the threshold for assessing impacts on PPHD (detailed in **Chapter 4**).**Tables 4-1 and 4-2** summarize the NE, NLAA and LAA determinations for species and critical habitats. **Table 4-3** summarizes the strength of evidence classifications for the LAA determinations.

**Table 4-1. Summary of Species Effects Determinations for Propazine (Counts by Taxon).**

|  |  |  |  |
| --- | --- | --- | --- |
| **Taxon** | **Step 1 Effects Determinations** | **Step 2 Effects Determinations** | **Totals** |
| **No Effect** | **May Affect** | **Not Likely to Adversely Affect** | **Likely to Adversely Affect** |
| Mammals | 85 | 14 | 10 | 4 | 99 |
| Birds | 88 | 20 | 10 | 10 | 108 |
| Amphibians | 28 | 8 | 0 | 8 | 36 |
| Reptiles | 38 | 9 | 9 | 0 | 47 |
| Fish | 161 | 29 | 19 | 10 | 190 |
| Plants | 914 | 34 | 20 | 14 | 948 |
| Aquatic Invertebrates | 182 | 25 | 9 | 16 | 207 |
| Terrestrial Invertebrates | 140 | 20 | 18 | 2 | 160 |
| Total | 1636 | 159 | 95 | 64 | 1795 |
| Percent of total | 91% | 9% | 5% | 4% |   |

**Table 4-2. Summary of Critical Habitat Effects Determinations for Propazine (Counts by Taxon).**

|  |  |  |  |
| --- | --- | --- | --- |
| **Taxon** | **Step 1 Effects Determinations** | **Step 2 Effects Determinations** | **Totals** |
| **No Effect** | **May Affect** | **Not Likely to Adversely Affect** | **Likely to Adversely Affect** |
| Mammals | 32 | 1 | 0 | 1 | 33 |
| Birds | 29 | 2 | 1 | 1 | 31 |
| Amphibians | 19 | 6 | 1 | 5 | 25 |
| Reptiles | 15 | 1 | 1 | 0 | 16 |
| Fish | 101 | 6 | 1 | 5 | 107 |
| Plants | 457 | 3 | 3 | 0 | 460 |
| Aquatic Invertebrates | 62 | 9 | 7 | 2 | 71 |
| Terrestrial Invertebrates | 40 | 9 | 9 | 0 | 49 |
| Total | 755 | 37 | 23 | 14 | 792 |
| Percent of total | 95% | 5% | 3% | 2% |   |

**Table 4-3. Classification of LAA Determinations by Strength of Evidence.**

|  |  |  |
| --- | --- | --- |
| **Strength of LAA call** | **Species range** | **Critical Habitat** |
| **Number** | **% of LAA determinations** | **Number** | **% of LAA determinations** |
| Strongest evidence of LAA | 29 | 45% | 9 | 64% |
| Moderate evidence of LAA | 17 | 27% | 2 | 14% |
| Weakest evidence of LAA | 18 | 28% | 3 | 21% |

1. Available at: <https://www.epa.gov/endangered-species/revised-method-national-level-listed-species-biological-evaluations-conventional> [↑](#footnote-ref-2)
2. The FAO mobility classification system is recommended for use in exposure assessments in the Office of Pesticide Programs in “*Guidance for Reporting on the Environmental Fate and Transport of the Stressors of Concern in the Problem Formulation for Registration Review, Registration Review Risk Assessments, Listed Species Litigation Assessments, New Chemical Risk Assessments, and Other Relevant Risk Assessments*” (USEPA, 2010). [↑](#footnote-ref-3)
3. The exposure models can be found at: <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment> [↑](#footnote-ref-4)
4. Available at: <https://www.epa.gov/endangered-species/revised-method-national-level-listed-species-biological-evaluations-conventional> [↑](#footnote-ref-5)