Sources, characteristics and opportunities for pesticide use and usage information applied to listed species risk assessment

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Introduction

One challenge in national-level pesticide endangered species risk assessments is the viable identification and incorporation of pesticide usage information in the risk assessment process.

Pesticide “usage” differs from pesticide “use”,

- “Use” is defined by registered labels and describes limits on how the pesticide may be applied (i.e., maximum rates and number of applications)
- “Usage” describes documented applications with specific information on each individual application event (usually surveys or self-reporting)

How can we utilize pesticide usage data to help inform our understanding of potential exposure?

Our goals:

- Account for variability in pesticide usage practices for which we have information
- Address uncertainty about which fields are treated (and to what degree)
- Must be applicable nationally, and suitable with existing species range definitions
- Transparent and robust (i.e., configurable)
- Ultimately provide context for potential exposure within the species range

Available usage data can improve exposure predictions and ultimately lead to improved risk assessments

1. Pesticide Usage Data

USDA NASS Agricultural Chemical Use Survey

CA Dept. of Pesticide Regulation, Pesticide Use Report (PUR)

Selected percentiles of reported application rate (per application) distribution for each pesticide applied in California from 2007-2017 for all program states combined. The maximum application rate listed on the label is 3 lbs/acre.

Probability distribution of percent of field treated (APFT) for carbaryl usage in the species range for a single trial, 90% of the area receiving applications in the species range received less than 36% of max. applications. Each trial in the simulation resulted in total acres treated between 110%-120% of the acreage estimated from an independent source.

2. Probabilistic Simulation - Visualization

Single trial showing spatial distribution of treated fields and off-field drift areas

Application to orchards

Variability in usage intensity

Off-field drift buffer

Overlap with localized areas

Probability distribution of annual percent of field treated (APFT) for carbaryl usage in the species range for a single trial, 90% of the area receiving applications in the species range received less than 36% of max. applications. Each trial in the simulation resulted in total acres treated between 110%-120% of the acreage estimated from an independent source.

3. Verification and Validation

A simulation consists of multiple trials (e.g., 1000) in which inputs are selected randomly based on probability, and each trial represents one possible instance. By running many trials, the range of possible outcomes is defined, as well as the most probable outcomes.

4. Summarization

The median of 1000 trials in the simulation indicated that 90% of the off-field area receiving drift from applications in the species range received less than 28% of the maximum usage from screening level exposure modeling.

Conclusions

- Real world pesticide usage data can help inform potential exposure for listed species risk assessment
- Approach presented here is applicable with a variety of sources for pesticide use sites; national USDA Cropland Data Layer and state-level sources
- The Usage Index concept normalizes simulation results to a reference (e.g., screening level use)
- Approach leverages known variability in pesticide usage data and agronomic practices
- Addresses uncertainty about which fields are treated (and to what degree) related to species range location
- Provides context for exposure based on pounds applied and spatial distribution of use sites within species range