Track: Environmental Risk Assessment

Session: Trends in Environmental Risk Assessment of Pesticides

Title: FRAGSTATS: Characterizing Spatial Interaction Between Pesticide Usage and Ecological Receptors to Inform Scenario Selection for Landscape Studies

Authors:
Logan Insinga and Christopher Holmes, Applied Analysis Solutions, LLC, Virginia, USA
Thorsten Schad, Bayer CropScience, Monheim, Germany

Abstract "Specific" Version:
Landscapes are often complex and difficult to interpret, especially in relation to potential influences of pesticide usage on local ecology. Accurate spatial representation of a stressor-receptor relationship can often be challenging to characterize when using simple geographic information system (GIS) tools. FRAGSTATS is an established and robust spatial analysis program that computes a wide variety of metrics to quantify landscape structure and interaction (composition and configuration). The current study utilized FRAGSTATS to rank the relative vulnerability of the wood mouse (*Apodemus sylvaticus*) in relation to Oilseed Rape (OSR) fields for over 2000 unique 25km^2 scenarios within a single study area in Poland. The results of the analysis were used to inform a scenario selection process. We examined over 25 combinations of metrics to assess cross correlation and utility for our specific study purpose. Scenarios were ultimately characterized based on the 'Edge Density' between potential application areas (i.e., OSR fields) and wood mouse habitat derived from remote sensing (i.e., grassland, woodland). The resulting quantitative ranking of relative scenario vulnerability was suitable for scenario selection as input to the ecological effects modeling phase of the larger study. Ultimately, scenarios and model results will be submitted for regulatory review in support of pesticide product registration in Poland. This study also leveraged Python scripting to integrate FRAGSTATS within ArcGIS Pro to automate a large portion of the workflow (see separate poster for details). The analysis presented here showed that FRAGSTATS is a powerful tool that can help describe landscape structure and interaction potential. It can be efficiently implemented over large extents and multiple scenarios to support landscape-level pesticide risk assessments.

Session description
Environmental risk assessments to evaluate the potential effects of uses of pesticides and resulting residues are continually evolving to meet changing needs, for example, in the context of addressing risks to threatened and endangered species and their habitat. However, assessments continue to heavily rely on the use of conservative exposure assumptions and sensitive effects endpoints in simple deterministic approaches. Despite the known inadequacies of using deterministic methods to represent realistic scenarios, higher tier testing and modeling approaches continue to be perceived as impractically complicated and subject to biased interpretation. To meet the need for refined assessment and communication, efforts are broadly underway to develop new methods to provide more nuanced assessments to better inform regulatory decisions. It is expected that this session will attract presentations including field-level studies of pesticide exposure and effects, setting protection goals, refined modeling approaches at the landscape and population level, examination of special exposure

scenarios such as run-off and volatility, application of weight-of-evidence approaches, probability-based decision making, uncertainty communication and surrogate suitability for listed species.