Evaluating Lines of Evidence in National Level Pesticide Endangered Species Assessments

Spatial Data | Biological Data | Critical Habitat and Indirect Effects | Refined Species Assessment | Dealing with Data Gaps

National Pesticide Endangered Species Assessment: Relationship of Crop to Known Species Location

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Abstract

The Environmental Protection Agency's Office of Pesticide Programs' (OPP) Registration and Registration Review process has entered the early phases of national level endangered species assessment for pesticide active ingredients. Here we discuss the use of species location data in endangered species assessments conducted for Registration Review under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Where spatial data exist for species listed by the Endangered Species Act (ESA), such data can be assembled, processed and applied for the determination of what species locations can be eliminated from concern based on their distance from a labeled crop. In applying such data to pesticide national level assessments for endangered species, the FIFRA Endangered Species Task Force (FESTF) has found that the best available spatial data typically address approximately 20% of the crop/use/species intersections that are generated by a national level endangered species assessment. Evaluating proximity data is therefore a useful part of the assessment process, especially when also supported by other lines of evidence which complete the analytical process. Additionally, the proximity and distributional data created for the assessment may have later use if and when county bulletins are needed for defining the locational extent of local species protection, should that be required. This poster demonstrates how FESTF's spatial data is used to efficiently display and assemble crop and species proximity, when species location data are available to assess such a relationship.

Introduction

In support of Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) product registration, the FIFRA Endangered Species Task Force (FESTF) has developed an endangered species assessment process based on evaluation of the co-occurrence of species listed by the Endangered Species Act (ESA) as threatened, endangered or proposed ("listed species") and use sites (typically crops) at the county-level (McGaughey, 2005). This process includes:

- The FESTF Information Management System (FESTF IMS), a system that was developed to house, compare and retrieve assessment information (McGaughey *et al.* 2005), and
- The FESTF Multi-Jurisdictional Database (FESTF MJD), a secure website providing access to specific location data on listed species (via a licensing agreement with NatureServe).

The FESTF IMS and FESTF MJD were utilized in an endangered species assessment pilot study as part of the Environmental Protection Agency's (EPA) Office of Pesticide Programs' (OPP) Registration and Registration Review process for the active ingredient, clomazone. The pilot study was conducted by the FESTF, EPA, and the registrant (FMC). Its purpose was to provide the EPA with information on:

- The location of listed species,
- Their proximity to sites where clomazone might be used, and
- Other site-specific and species-specifics factors that may influence potential exposure of listed species to clomazone.

The pilot study found that, where the best available spatial data exist for listed species and potential use sites, such data can be assembled, processed and applied in the FESTF IMS to provide the EPA with decision support to remove species locations from concern. Out of the universe of species/crop co-occurrences in the clomazone assessment, decision support is available for approximately:

- 20% based on calculated distances from labeled crops, and
- 60% based on additional types of data (habitat, reported crop locations, diet, etc).

Taken from the process utilized in the clomazone pilot study, this poster demonstrates how FESTF's spatial data is used to efficiently display and assemble species and crop proximity, when species location data are available to assess such a relationship.

The Role of the FESTF IMS

The FESTF IMS provides a mechanism by which data relevant to endangered species assessments can be stored, managed, and retrieved. It allows county-level comparisons of listed species locations, pesticide use locations, and any existing management decisions.

The core of the FESTF IMS contains the best available county-level location information on crops from the Census of Agriculture (USDA, 1997, 2002, and 2007) and listed species from:

- EPA OPP (EFED), provided to FESTF in June, 2003,
- Location data from the FESTF MJD, and
- U.S. Fish and Wildlife Service and National Marine Fisheries Service species by county presence lists (retrieved and updated yearly). Example: http://www.fws.gov/southwest/es/arizona/Documents/CountyLists/Statewide.pdf.

These datasets can be queried to obtain a list of species/crop intersections by county for assessment of potential exposure of listed species.

Supporting documentation and analyses, such as a proximity analysis utilizing spatial data as explained below, can be generated outside of the FESTF IMS, stored in the FESTF IMS, and associated with specific co-occurrences. The information can then be retrieved by the EPA to support their final determination of what species locations can be eliminated from concern based on their distance from a labeled crop, existing management decisions, or other reasons that would preclude exposure.

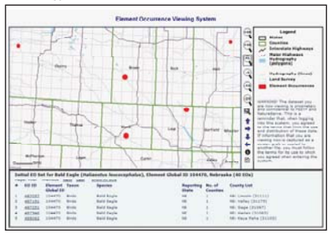
Best Available Spatial Data

Listed Species

EPA directed FESTF to consider NatureServe, the developer of the only fully-aggregated national dataset on species distribution in the U.S., as possibly the "best available" national-level data on listed species. A detailed evaluation of the NatureServe data was conducted by FESTF to improve understanding of the data and help provide guidance to data users with respect to data interpretation and quality (McGaughey *et al.* 2007). This evaluation showed the database to be stable over time and confirmed the thesis that it provides a reliable source of high quality species data for the U.S.

Via a licensing agreement with NatureServe, FESTF obtained access to specific location data on listed species, which is housed in the FESTF MJD. The FESTF MJD includes detailed biological data, access to spatial data files for use in a geographic information system (GIS), and a map viewing window (Figure 1). Species locations in the FESTF MJD, referred to as Element Occurrences (EOs), are represented as polygon features and are either plotted manually or mapped in GIS using Biotics Mapper (a mapper tool developed by NatureServe) (NatureServe, 2009).

Figure 1. FESTF MJD map window (data falsified to protect sensitivity)



Listed Uses (Crops)

Counties containing specific crop use sites can be determined from the Census of Agriculture (http://www.agcensus.usda.gov/). The Census of Agriculture is described by the USDA as "the only source of uniform, comprehensive agricultural data for every state and county or county equivalent in the United States." The Census is conducted every five years, and the 2007 Census is the most recent that has been published.

Specific crop location data within counties is not uniformly available for use in national assessments. However, high-resolution spatial data on the location of cultivated crops throughout the U.S. is available from the U.S. Geological Survey (USGS) 2001 National Land Cover Database (NLCD). For cultivated crops, land cover locations are represented by the class 82 and grid cells can be extracted and converted to polygons for spatial analysis.

Utilizing Best Available Spatial Data in the Endangered Species Assessment Process

Proximity Analysis

Once the best available information on species and crop locations is compiled, extracted, and converted to polygons where appropriate, distances between the species and the nearest cultivated crop land cover (NLCD, class 82) in the same county and in neighboring counties is calculated (Figure 2). Accounting for distances to cultivated crops in neighboring counties helps to account for potential exposure via environmental processes.

Figure 2. Calculating distances between species locations and cultivated crops

After all distances are calculated, then for each species/county co-occurrence, the minimum distance from any species location to cultivated crops is identified (for example, 0.70 miles in Table 1).

Table 1. Species locations in Gulf County, FL (EOs from FESTF MJD) and calculated distance to cultivated crops (NLCD, class 82)

EO Identifier in Gulf, FL	Shortest distance (in miles) from EO to cultivated crops in each county				
	Gulf, FL	Bay, FL	Calhoun, FL	Franklin, FL	Liberty, FL
1	15.48	26.15	23.99	100.42	40.16
2	14.46	31.7	41.36	98.67	40.73
3	12.36	33.60	34.87	101.97	46.01
4	2.98	43.71	22.50	91.51	44.87
5	0.70	41.8	24.97	70.89	52.97
6	0.67	43.55	26.87	77.25	51.35
7	2.68	48.10	38.48	80.08	49.54
8	6.17	53.13	41.36	75.62	54.26

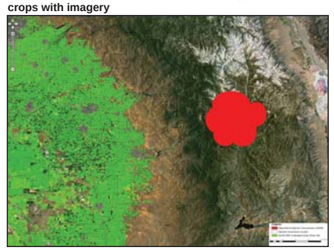
The minimum distance is used to assess whether or not exposure is likely based on spatial separation. This process was utilized by the EPA in the Registration Review Draft Ecological Risk Assessment and Effects Determination for Clomazone (2009).

The distance needed to support a spatial separation, or proximity exclusion, depends in part on the mobility of the product in question in various environmental media, and in part on the topography and vegetation between the species location and use site.

Topography and Vegetation between Species Locations and Cultivated Crops

The topography and vegetation between species locations and use sites can be examined and assessed to determine if mitigating factors offset what may appear to be spatial proximity. Coupled with biological information about the species, such as habitat, spatial data can be used to conclude that species locations are not at risk from potential exposure. In Figure 3, it could be concluded that pesticide applications on cultivated crops in this location are unlikely to reach the species' high elevation habitat.

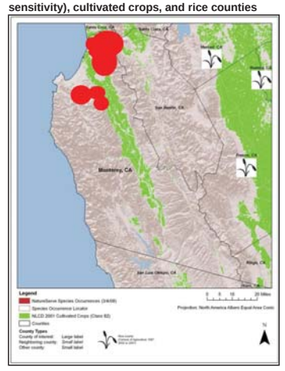
Figure 3. Visual representation of FESTF MJD species locations (data falsified to protect sensitivity) and cultivated crops with imagery



Species Locations and Specific Crops

Counties containing specific crops can be obtained from the Census of Agriculture and used to determine that there are no labeled use sites in the county of interest. Figure 4, taken from the clomazone assessment, illustrates that the minimum distance between species locations and cultivated crops can be within the distance for potential exposure, but exposure is unlikely because registered use sites (rice) are not reported within this distance.

Figure 4. Locations of a listed species in Monterey County, California (data falsified to protect sensitivity), cultivated crops, and rice counties



Conclusion

Providing access to and utilizing the best available spatial data on crop and species proximity, combined with additional types of data such as species habitat and reported crop information, allows assessors to make informed decisions about potential impacts of particular pesticide uses to listed species locations, in specific local areas. When used in the assessment process, the FESTF IMS ensures the use of best available data, provides an aggregated species location data source, and provides a consistent, reliable, and transparent assessment. This was employed in the Registration Review endangered species assessment pilot study for clomazone. The pilot study provided decision support to EPA for about 20% of species locations based on distances from labeled crops, and an additional 60% based on other types of data. Additionally, the proximity and distributional data created for the assessment can be retrieved from the FESTF IMS and have later use if and when county bulletins are needed for defining the locational extent of local species protection, should that be required.

References

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