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

A Comparative Examination of Endangered Species Pesticide Effects Determinations Driven by Varying External Forces

Tilghman Hall[1], Bernalyn D. McGaughey[2], David A. Howes[2]

[1]Bayer CropScience, Research Triangle Park, NC, USA, [2]Compliance Services International, Lakewood, WA, USA

Abstract

In taking pesticide registration or Registration Review actions as governed by the Federal Insecticide, Fungicide and Rodenticide Act, the Environmental Protection Agency's Office of Pesticide Programs (OPP) also must comply with the Endangered Species Act (ESA) by ensuring that its registration action is adequately protective of listed species. This is a multidimensional process involving many layers of evaluative steps and stakeholder review. Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), OPP is faced with assessing the impact of its action on a national basis. This scope of evaluation is relatively unique to endangered species assessment. It is therefore of interest to examine the layers of evaluative steps and how they are similar or different when the source of the trigger for the action differs. While the ESA was created with the vision of protecting a given species from a given action at a given site (for example, the clearing of land to build a housing development), ESA effects determinations must also be conducted when a government agency must evaluate land use (e.g, grasslands that are grazed but have invasive species pressures), or when OPP takes the action to register or re-register a pesticide active ingredient. It is instructive to examine the details, approach and redundancies or differences introduced in these multiple approaches to species evaluation and protection. This paper compares these intersections of evaluation, how some redundancies might be eliminated and what elements of varying types of assessments may contribute to a more cohesive and less laborious process of pesticide evaluation and species protection.

Evaluation Steps based on Trigger for Assessment

The ESA requires any federal action, or private action requiring a federal permit, to comply with the terms of the act by ensuring that the action has no direct or indirect effect on a listed species or its designated critical habitat. With respect to the regulation and registration of pesticides, this ESA requirement may arise from:

- Registration or reregistration process – often product/active ingredient-specific covering species at the national level;
- Litigation – focus is species-specific with regional boundaries for one or more active ingredients;
- Site specific - from litigation or local permitting actions.

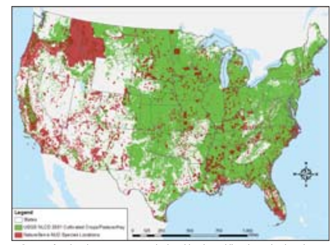
At this time, EPA's Office of Pesticide Programs (OPP) has completed three national level endangered species assessments in the course of launching their active ingredient evaluations under Registration Review. Litigation driven assessments have been conducted for a large number of active ingredients relative to salmon in the Pacific Northwest, California red-legged frog, and some aquatic species in the Southeast and Chesapeake Bay regions. Assessments for the Barton Spring Salamander have been litigation driven, but provide examples of a site-specific analysis, such as those which can occur through local agencies. If EPA concludes a potential risk for a species (likely to adversely affect) then the assessments, no matter what origin, will be submitted to the Fish and Wildlife Service and/or National Marine Fisheries Service for consultation.

This poster examines how key elements of an endangered species assessment (scope, definition of the action area, relevant end points, exposure assessment and local conditions) vary depending upon the scale of the evaluation.

Table 1. Potential Studies Available for Endpoint Selection (from US EPA Office of Pesticide Products)

TAXA	TESTING REQUIREMENT
	Acute Oral LD50 Subacute Dietary LC50 Chronic Reproduction
Mammals	Large suite of tests including acute oral, and chronic developmental and reproduction tests
Freshwater Fish and Invertebrates	Fish acute LC50 Fish early life stage test (NOEC) Fish life cycle test (NOEC) Aquatic invertebrate acute LC50 Aquatic invertebrate chronic life cycle (NOEC)
Estuarine/Marine Fish and Invertebrates	Fish acute LC50 Fish early life stage test (NOEC) Fish life cycle test (NOEC) Aquatic invertebrate acute LC50 Mollusc EC50 (shell growth) Aquatic invertebrate chronic life cycle (NOEC)
Aquatic Plants	Vascular plant (Lemna) EC50 and NOEC for growth rate and biomass Non-vascular plants (1-4 algal species) EC50 for growth rate and biomass
Sediment Organisms	Acute and/or chronic data
Nontarget Terrestrial Plants	Seedling emergence (10 species EC25 and NOEC) Vegetative vigor (10 species EC25 and NOEC)
Nontarget-terrestrial arthropods	Honeybee acute contact (LD50) Honeybee acute oral if registered in the EU (LD50) Other species if product registered in the EU
Soil Organisms	Earthworm and other organisms (acute and chronic) if product registered in the EU
Required for registration of pesticides in US; Conditionally for registration in the US; Required for registration in the EU	

National Level Endangered Species Assessment Supporting Pesticide Registration or Reregistration Actions



Scope of national assessment: agricultural lands and listed species locations

The three active ingredients subject to EPA's initial national-level endangered species assessments are clomazone, fomesafen and urea sulfate. In these three assessments, three very different approaches to assess complex issues were used, but all three approaches required an assessment of extremely complex relationships, on a national scale, in a condensed timeframe. As such, the national level assessment, while perhaps not intended to be so, is a screening level assessment that cannot possibly incorporate all of the details necessary to reach a scientifically defensible conclusion about the potential effect of a registered product on all listed species in all states where it might be used. Addressing endangered species on a national scale is a huge undertaking that requires careful consideration on how, when or if one can deal with any or all of the species- and location-specific details that are relevant.

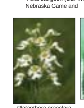
Dancing whooping cranes (USFWS photo)

Challenge
- Huge geographic coverage and large number of species.
- Full and accurate analysis requires highly detailed and local information.
- For refined assessments, see challenges in other assessment type.

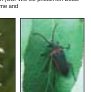
Palid sturgeon (USFWS file photo/Ken Bouc/ Nebraska Game and

Geographic Scope/Scale
- 50 states plus US Territories (3240 counties).

Species
- 1320 species (747 plants and 573 animals).



Platanthera praeclara Photo by J. Challey (USFWS photo)



Valley elderberry longhorn beetle (USFWS photo)

Defining the Action Area
- In a national assessment, definition of the action area must begin with the distribution of potential uses and use locations, as defined by the product label. Use sites, such as a type of crop, can be spatially defined using land cover data.
- All potential uses must be assessed in the entire US and its territories. Depending on the label(s) this may include agricultural and non-agricultural uses (e.g., forestry, urban, right-of-way, aquatic uses…).
- Geographic areas restricted by or excluded from the label are often the only means of reducing the assessment to something less than the entire US.

Selection and Use of End Points
- Direct effects: Because all taxa may be evaluated, surrogate species toxicity values from standardized testing (FIFRA GLP studies) provide a solid basis for evaluation (See Table 1 for example of available data).
- Indirect effects: Potentially difficult to reduce to reasonable selection since indirect effects could be tied to species obligate on a certain food source, habitat characteristics, dietary preferences, for every species likely to be indirectly affected.

Conducting the Exposure Assessment
- Variable routes of exposure for both direct and indirect effects.
- Aquatic: Highly conservative exposure estimates for varying number of crops, use patterns, climates and US geographical regions.
- Terrestrial: Non-localized drift and/or runoff estimates as appropriate to taxa.
- Refinement is desirable, and necessary for mitigations, but scale makes it problematic.

Incorporating Information on Local Conditions
- Overwhelming unless data are collected over time.
- Greatly aided by participation of local agencies (USDA, states) at the beginning of the assessment process.

Litigation Driven Endangered Species Pesticide Assessments

Over the last 10 years, multiple litigation driven assessments on pesticides have been scheduled by court order or stipulation agreements. These have involved dozens of species and hundreds of pesticide uses. To date, only 6 products have reached the biological opinion stage, and only 3 have mitigations proposed by EPA in response to the reasonable and prudent measures and reasonable and prudent alternatives posed by the biological opinions. These first opinions, dealing with effects determinations on salmon, are also a result of court-ordered scheduling of Services' responses to OPP effects determinations.

Chinook Salmon Photo by Dave Bickford

Challenge
- Multiple states and watersheds.
- Unknown or poorly defined "species location."
- Protection of species with minimal impact to agriculture when assessments or consultations do not consider all available information from all stakeholders.

Geographic Scope/Scale
- 4 states (or regions within states) (129 counties for 28 salmon ESUs).

Species
- 28 ESUs for 5 anadromous fish species (Chinook, Chum, Coho, Sockeye, Steelhead)

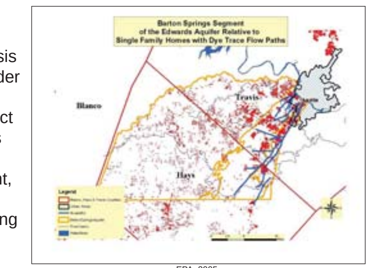
Defining the Action Area
- In a species-specific assessment, action area begins with the distribution of the species and their designated critical habitat. Potential uses and use areas are restricted to only those for the region.

Selection and Use of End Points
- Direct effects: For salmonid assessments toxicity values for aquatic vertebrates (standardized FIFRA GLP testing or high quality published literature) and data for species of concern or surrogate species.
- Indirect effects: Effects data for potential salmonid prey items or principle components of salmonid habitat (aquatic or riparian plants providing shelter or cooling) from standardized FIFRA GLP testing or high quality published literature. Requires good knowledge of salmonid biology.

Conducting the Exposure Assessment
- Expected or modeled concentrations in water in region of interest.
- Concentrations likely to affect near-shore habitat in region of interest.

Incorporating Information on Local Conditions
- While a great deal of state and federal data exists on salmon migration and their presence in streams, local information with respect to the timing of pesticide use and the actual presence of salmonid species is difficult to find or aggregate for an assessment.
- The environmental baseline for the species is difficult to obtain and/or utilize in assessing impact of additional stressors.

Local Area Endangered Species Pesticide Assessments



EPA, 2005

Many local programs involving pesticides undergo an additional layer of review on a site-specific basis either in response to litigation or under NEPA, wherein an Environmental Assessment or Environmental Impact Statement is generated for activities such as golf course construction, right-of-way vegetation management, harvesting of timber on federal or state lands, or the issuance of grazing permits for public lands. Where the use of pesticides is a part of this dynamic, independent review of their properties and the conditions of use for the specific application are evaluated, including their potential impact on endangered species. However, there is no connection between FIFRA driven reviews and those conducted under other forums. The OPP effects determination on the Barton Springs Salamander, again a litigation driven assessment, provides an example of the additional layers of detail that can be included when an effects determination is highly site-specific.

Challenge
- Understanding current conservation measures in context of pesticide risk assessment.
- Defining pesticide use in urban and agricultural areas that may contribute to exposure.
- Capturing local information that can be used subsequently in national level assessments.
- Unique hydrology of Barton Springs.

Barton Springs Salamander Photo, University of Texas Environmental Science Institute

Geographic Scope/Scale
- 1 state, only 3 counties.

Species
- One.

Defining the Action Area
- In a site-specific assessment, the action area can be well proscribed by individual species locations and critical habitat.
- Multiple land uses and hydrological connectivity can be specifically mapped with respect to their relationship to the species.
- The area that should be included in addressing indirect effects can be confined to the watershed or geographic subunit under examination.

Selection and Use of End Points
- Toxicity values from standardized testing (FIFRA GLP studies or high quality published literature) on amphibians (or fish as a surrogate if amphibian data are not available) provide closely related surrogate species as a primary basis for evaluation.
- Aquatic prey and habitat for indirect effects (aquatic invertebrates, algae and plants).

Conducting the Exposure Assessment
- Highly specific for one aquatic species in one limited region.

Incorporating Information on Local Conditions
- A site-specific assessment provides a forum that more readily incorporates knowledge of local conditions and pesticide use patterns.
- Specific conservation practices can be identified and used to modify exposure assumptions.
- Where mitigation is necessary, local knowledge can contribute to refining the use restrictions to those most protective of the species and practical for the pesticide user.

Key questions for endangered species assessments

1. Given the scale, what can reasonably be accomplished in the Pesticide Registration Review schedule (70 assessments per year for 15 years)?
2. Stakeholders are integral to this process, if they are excluded this is likely to lead to further litigation. How can communications be enhanced to significantly improve the process?
3. Section 1010 of the Endangered Species Act requires any implementation to be undertaken with minimal impact on agriculture. While protection of species is imperative, how and when is the impact on agriculture assessed to ensure Section 1010 is followed? And how does one assess the potential impact on agriculture?
4. For national scale endangered species assessment, what is the number of exposure scenarios needed to represent the entire US and all species? Do current exposure estimates give due consideration to the varying habitat types for endangered species?
5. What is the level of protection for indirect effects or habitat assessments and how does that translate to an exposure extent within a geographic area?
6. Does the available data for surrogate species represent all endangered species?
7. How do regional or localized assessments roll into the national registration process?
8. How can national information be more readily made available to the local process?
9. How can local conditions and mitigations described and assessed in local programs be communicated and utilized in the national process?

Recommendations

- Define a process that brings greater transparency to how endangered species assessments are conducted, the key inputs and methods, and the roles of EPA, Services and Stakeholders. If consultation is likely to be required, develop a process that brings more efficiencies through utilization of Alternative Consultation Agreement(s) and informal consultation, as appropriate.
- Use panels, workshops or other open forum(s) to develop consensus on use of surrogate species, appropriate exposure scenarios and other key scientific questions.
- Fully identify and involve key Stakeholders: Registrant/ Applicant, USDA, Grower Groups, and other affected parties.
- During the assessments (whether conducted by EPA or the Services), involve stakeholders *early* in the problem formulation and risk characterization.
- Bring better spatial definition to the action area through development of better models or refinement of existing models.
- Having agreed upon data quality standard that guides data point use quantitatively, qualitatively or if certain should data should be used at all.
- Incorporate local conservation measures and local use information into the assessment, and retain local information for future assessments conducted in the same area or on the same species (for example, by using a system like the FESTF Information Management System).
- If additional mitigation is developed involve stakeholders that have the best available information on agriculture to ensure all options are considered and utilized.
- Process needs to ensure it does not erode current conservation practices.