Ecological Risk Assessment Framework for Endangered Species Risk Assessments

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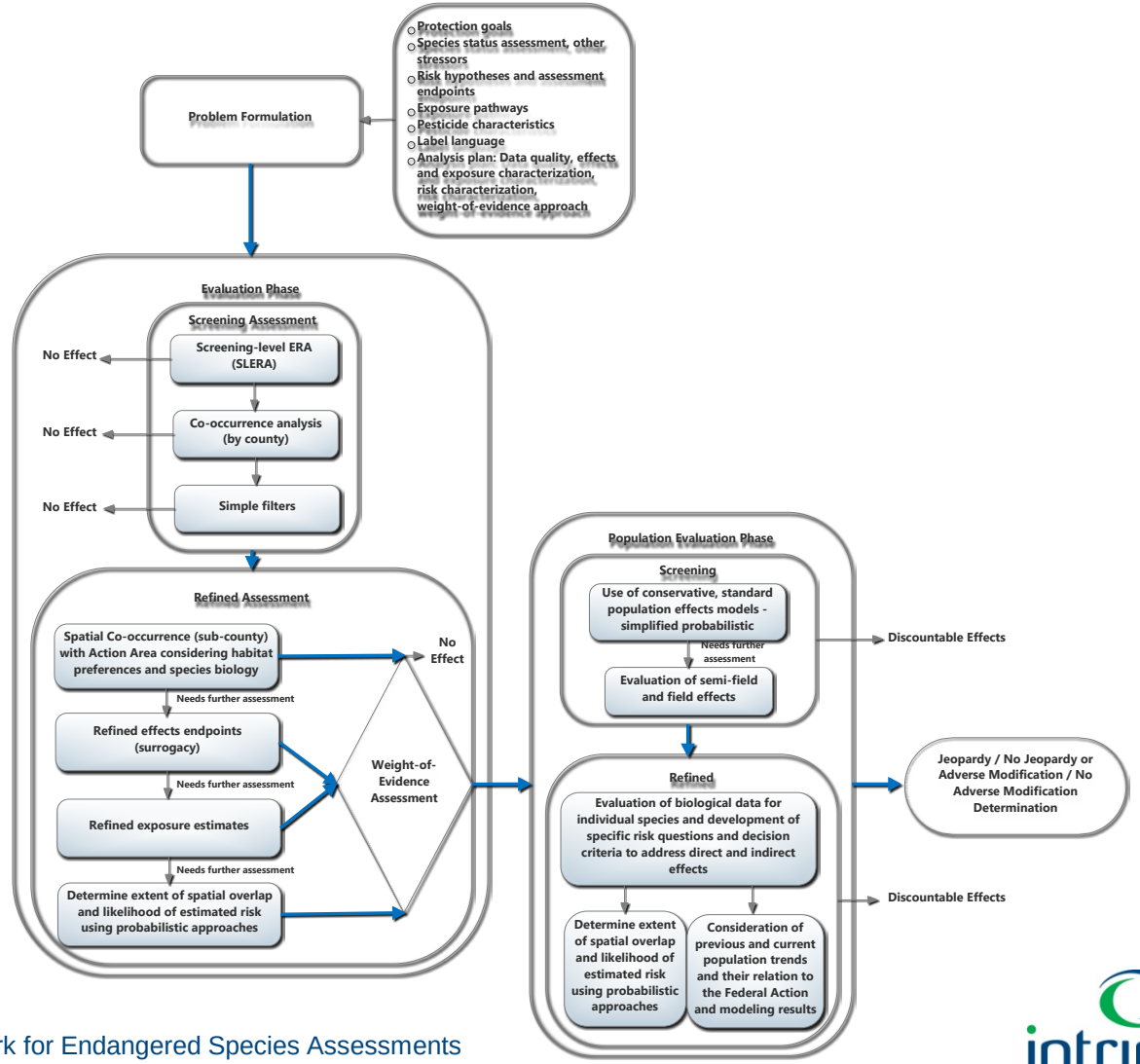
Objectives

- Assist ***Risk Assessors*** in developing an efficient, consistent, and sustainable process for evaluating risk of crop protection products to Endangered Species Act (ESA) listed species and their designated critical habitat
  - EPA will have over 1,160 different active ingredients needing registration reviews in the next 6 years (according to 'Farm Bill')
  - Currently 1662 listed species + designated critical habitat
- Provide ***Risk Managers*** with the information necessary to make science-based, defensible regulatory decisions
- Even with administrative / legislative adjustments there will still be a need for robust, defensible, scientific approaches that are efficient

Objectives

- **<u>Take advantage of:</u>**
  - EPA Ecological risk assessment guidance (EPA, 1992; 1998; 2004)
  - Counterpart regulations 2004 (50 CFR Part 402)
  - National Research Council – National Academy of Sciences panel report (2013)
- **<u>Learn from:</u>**
  - Interagency interim guidance (2013);
  - All public workshops (EPA/Services/USDA)
  - Individual species risk assessments (e.g., CRLF, Delta Smelt)
  - EPA Draft / Final Biological Evaluations – Organophosphates
  - Comments on Biological Evaluations
  - NMFS Biological Opinion

ESRA Framework



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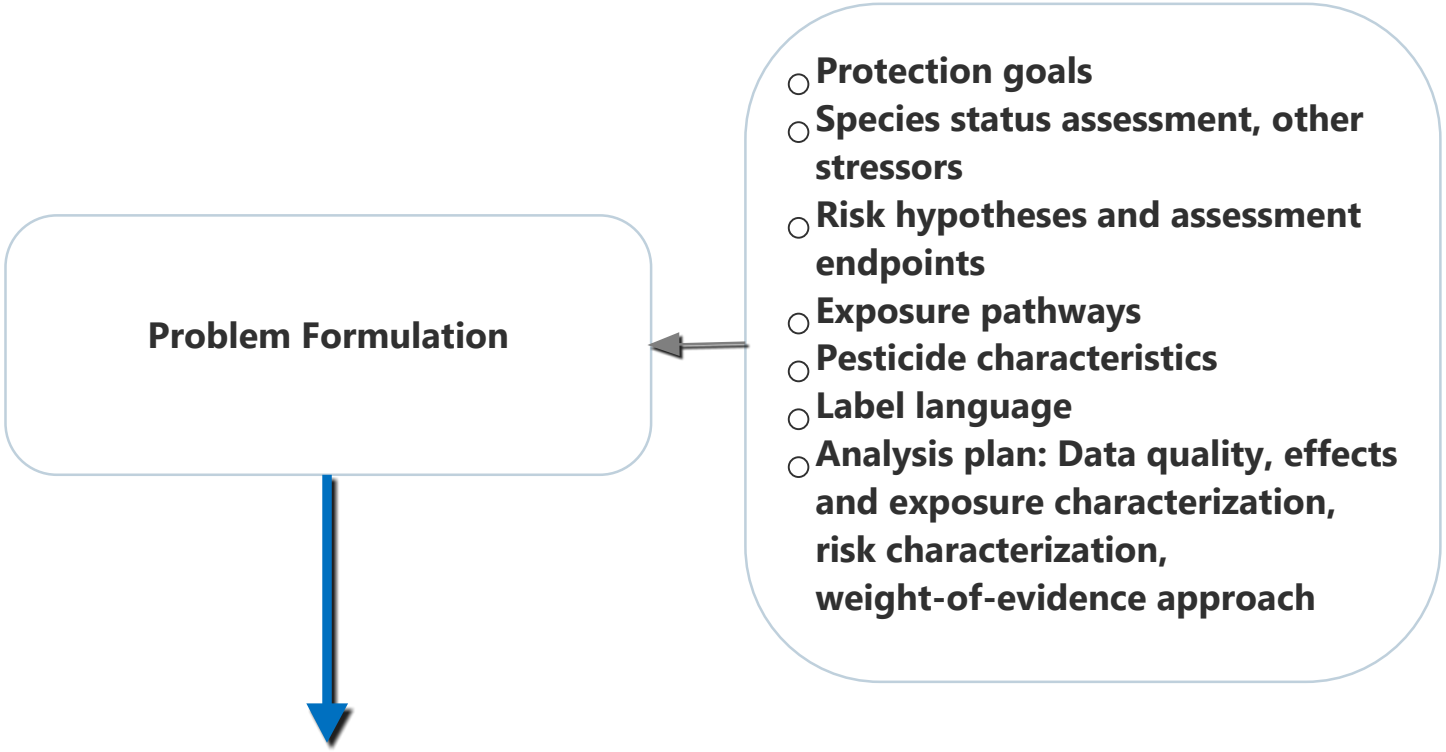
Problem Formulation



Note:

- Conduct data quality evaluations (e.g. literature review – Acceptable, Supplemental, Unacceptable)

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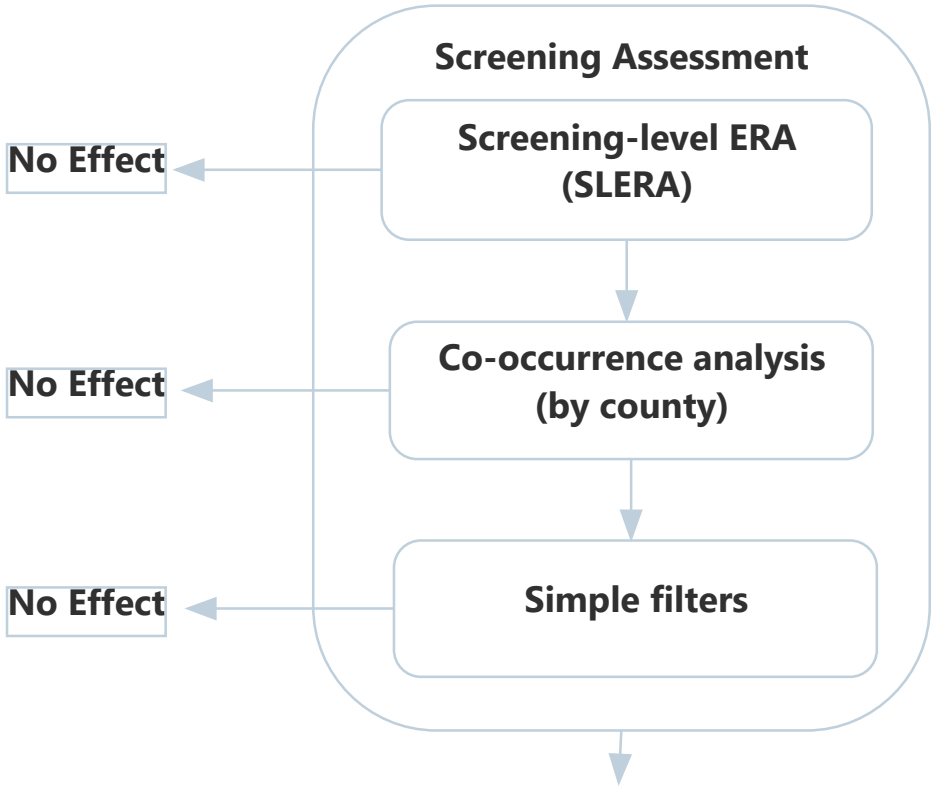
Evaluation Phase: Screening



- SLERA
  - FIFRA style
  - Conservative
  - Coarse filter to identify tolerant vs sensitive species
- Co-occurrence
  - Use pattern vs species range overlay
  - Proximity analysis
- Simple filters
  - Are there life history, dietary, habitat or location specifics that restrict exposure potential

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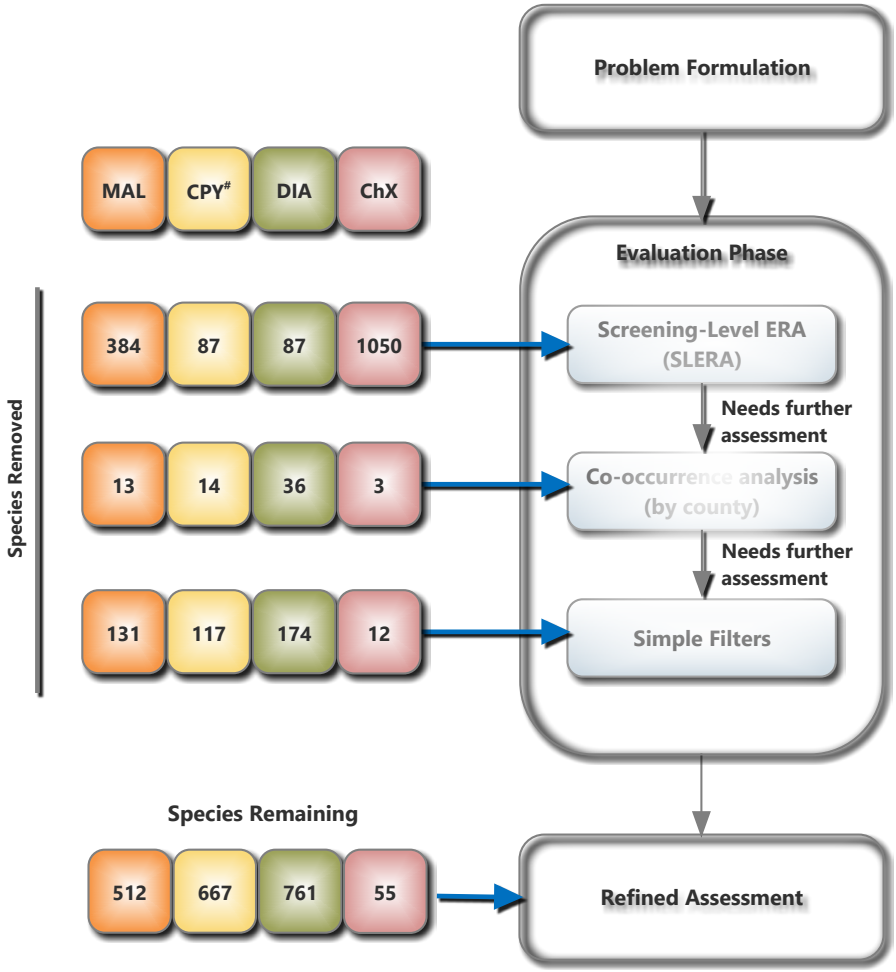
Practical Examples: Screening Evaluation



- Pesticide characteristics make a big difference
  - Broad spectrum vs specific
  - Use pattern extent
- In all cases the evaluation phase helps focus the assessment

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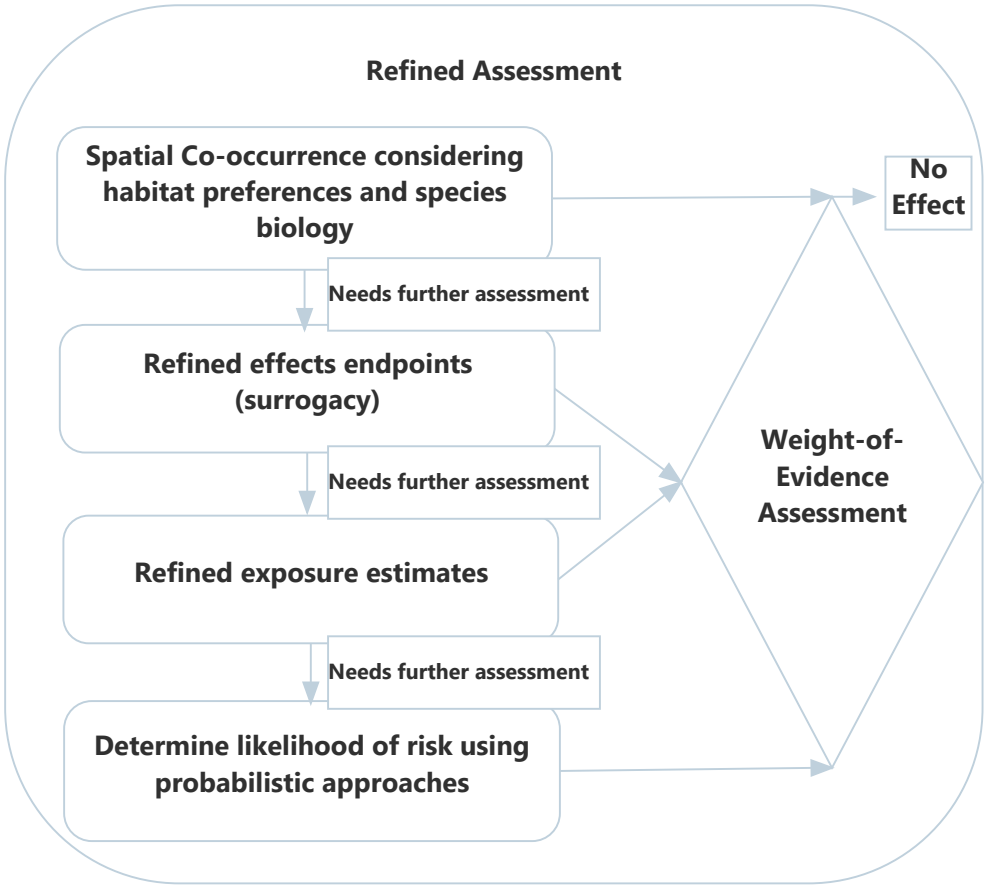
Evaluation Phase: Refined



- Refined Exposure Estimates
  - Refined PWC
  - Watershed modeling
  - Terrestrial exposure
- Probabilistic approaches
  - Percent cropped area
  - Probability of spatial overlap given uncertain species ranges and crop variability
  - Variable diets, much more
- Weight-of-evidence assessment
  - Quantitative
  - Qualitative
  - Lines of evidence

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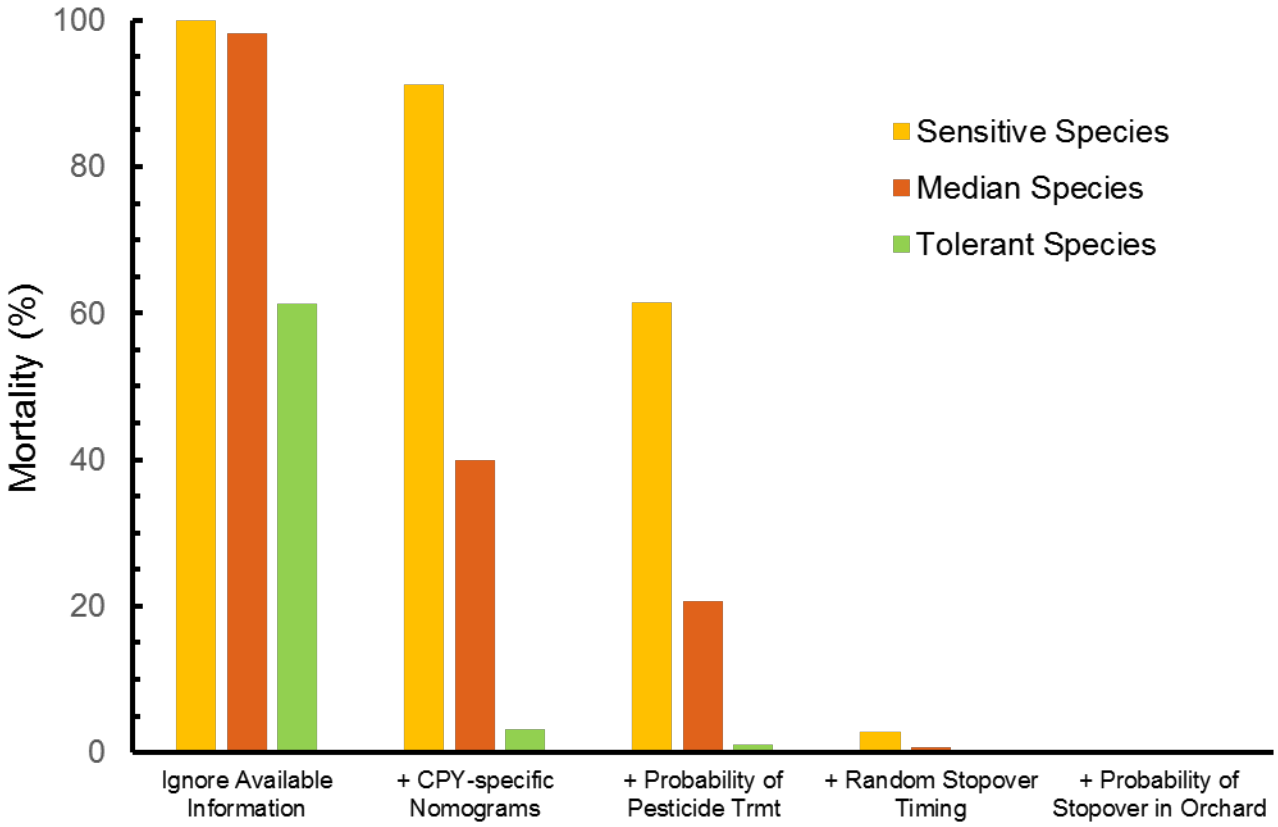
Practical Examples: Refined

Kirtland's warbler

- Breeding season model (acute and chronic)
  - 60-day period with 10-minute time step following initial pesticide application
  - Residues adjusted for distance between foraging location and treated crop
  - Probabilistic model that simulates 10,000 birds
- Migration model (acute only because stopovers are brief)
  - Spring and fall migrations through states having orchard crops potentially treated with chlorpyrifos or malathion
  - For each bird, randomly determine: migration duration, length of each stopover, whether stopover in a treated orchard, time since pesticide application
- Results: Very low acute and chronic risk for both pesticides. Consistent with recent proposal to down-list Kirtland's warbler – Endangered to Threatened
- Habitat loss and cowbird predation are the issues

Migration Model: Reality Matters!



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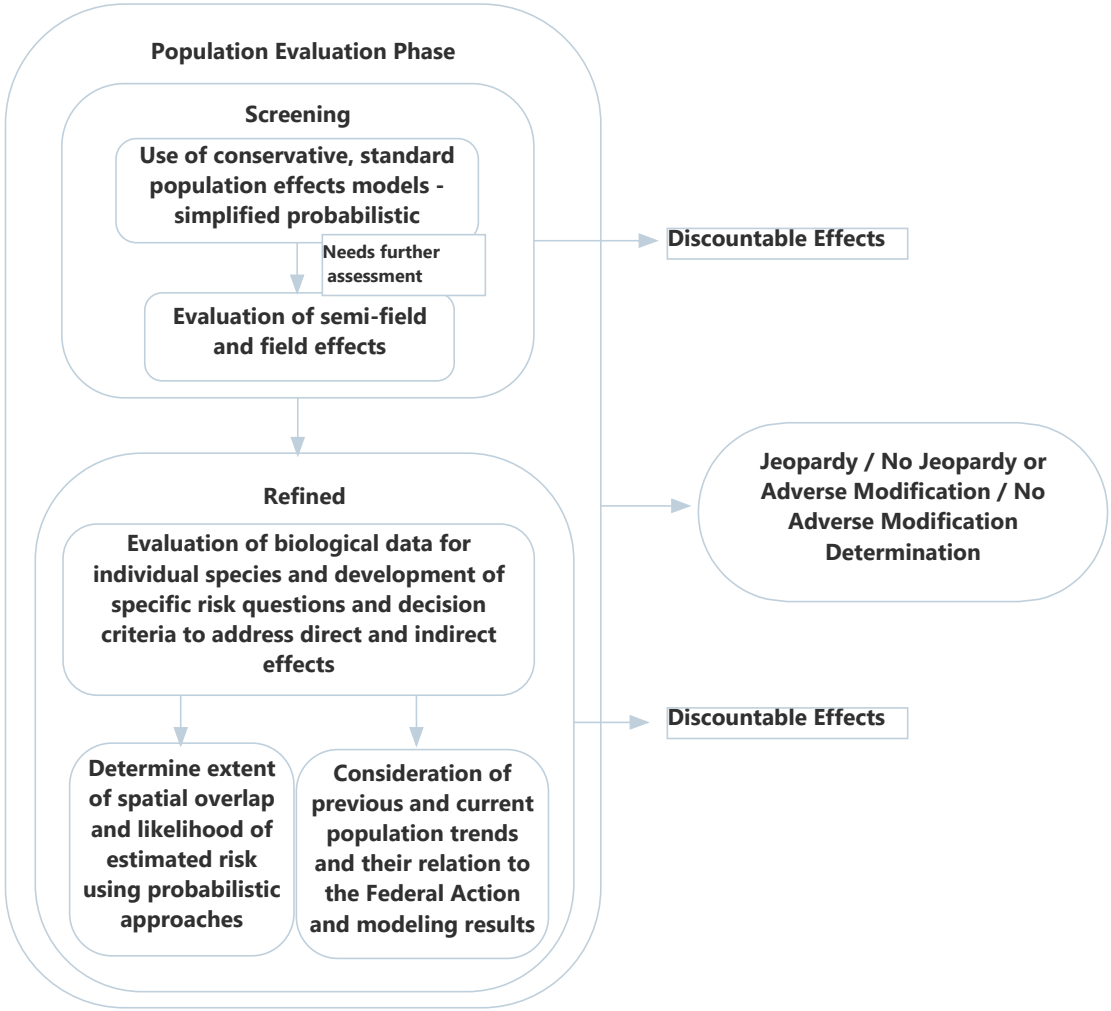
Additional Refined Examples

- D.R.J. Moore, C.D. Priest, A.D. Olson, and R.S. Teed. 2018. A probabilistic risk assessment for the Kirtland's warbler potentially exposed to chlorpyrifos and malathion during the breeding season and migration. IEAM 14(2):252-269
- Clemow, Y.H., G.E. Manning, R.L. Breton, M.F. Winchell, L. Padilla, SI. Rodney, J.P. Hanzas, T.L Estes, K. Budreski, B.N. Toth, K.L. Hill, C.D. Priest, R.S. Teed, L.D. Knopper, D.R.J. Moore, C.T. Stone, P. Whatling. 2018. A refined ecological risk assessment for California Red-legged Frog, Delta Smelt, and California Tiger Salamander exposed to malathion. IEAM 14(2):224-239.

Methods

- Brain, R., R.S. Teed, J. Bang, P. Thorbek, J. Perine, N. Peranginangin, M. Kim, T. Valenti, W. Chen, R.L. Breton, S.I. Rodney, D. R.J. Moore. 2014. Risk assessment consideration with regard to the potential impacts of pesticides on endangered species. IEAM 11(1):102-117.
- Budreski, K, M. Winchell, L. Padilla, J. Bang, R.A. Brain. 2015. A probabilistic approach for estimating the spatial extent of pesticide agricultural use sites and potential co-occurrence with listed species for use on ecological risk assessments. IEAM 12(2):315-327.

Population Evaluation: Screening / Refined



- Screening-level
  - Deterministic
  - Scalar models
  - Life-history (matrix) models
- Refined
  - Probabilistic
  - Individual based models
  - Metapopulation models
  - Can be data intensive

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Conclusion

ESRA Framework is intended to:

- Ensure the best available information is used and communicated
- Encourage the use of a hierarchical approach with risks and uncertainties clearly captured
- Considers species biology, habitat and location are appropriately incorporated in the assessment
- Result in refined (e.g., probabilistic) risk assessment for some species to provide a better basis for understanding the potential for risk, and to identify and evaluate possible mitigations where risks to listed species are found to exist

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