Linking Pesticide Application at Local Scales to Population-Level Assessment Endpoints: a Case Study of an Endangered Songbird Population in the Willamette Valley, OR

Dishman, D.L.[1]*, Schumaker, N.H.[2], and Miewald, T.[3]

[1]Integral Consulting Inc., Portland, OR, [2]USEPA Western Ecology Division, Corvallis, OR, [3]USFWS Region 1, Portland, OR

Threatened and endangered species are increasingly impacted by agricultural pesticides. Interest in developing regulatory approaches that address pesticide impacts on populations is creating a need for risk assessment tools that capture interactions between life histories and spatially-distributed stressors at landscape scales. Such applications can also inform risk management decisions at contaminated sites that span large spatial areas. Here, we illustrate how a spatially-explicit IBM (individual-based model) can help researchers and regulators link the application of pesticides at local scales to the range-wide population dynamics of an endangered bird. We patterned our simulation model after an endangered subpopulation of streaked horned larks (*Eremophila alpestris strigata*), whose range falls within Oregon's Willamette Valley -- an area dominated by agriculture that also includes a network of natural areas and wildlife refuges. We use our model to evaluate the consequences for horned larks of alterations to the extent and pattern of pesticide applications, and we illustrate how the results can be used to characterize population response to stressors at large spatial scales. These evaluations have led to insights into the potential of a network of habitat refuges to mitigate the impacts of pesticides on horned larks. Lessons that we have learned from this work have application in remedy selection where the spatial configuration of various potential remedies provides differing extents and patterns of refugia. Spatially explicit population modeling can be used to optimize protectiveness at the population level when selecting a final remedy.

Contact author: Diana Dishman, Integral Consulting Inc.
319 SW Washington St., Suite 1150
Portland, OR, 97204
Phone: (503) 943-3619
Fax: (503) 284-5755
Email: ddishman@integral-corp.com

Presenter: Diana Dishman, Integral Consulting
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Student: Not a student