Introducing RAMAS® IRM

Investigate the complex interaction of population dynamics, population genetics, and insect resistance management strategies with a flexible tool that removes barriers to powerful modeling. The total integration of landscape, demography, and evolution places IRM at the cutting edge of landscape genetics and applied evolution.

Our goal in the development of RAMAS® IRM is to provide a common platform for insect resistance modeling. This approach will increase transparency in regulatory decisions and fuel innovation in crop protection while encouraging uniform scientific standards.

Join the Process

We want your help

While we are experts at developing and implementing methods for environmental risk analysis, no one knows the needs of the IRM community better than the community itself. Applied Biomathematics® invites feedback on our first release of RAMAS® IRM as well as active collaboration in specifying future versions.

Try it out

Look for a downloadable evaluation release of version 1.0 beta in late 2012 at:

www.ramas.com/IRM

Contact Us

Direct questions and comments to:

Nicholas Friedenberg
Senior Scientist
Applied Biomathematics
100 North Country Rd
Setauket, NY 11733

631-751-4350
nick@ramas.com

Visit www.ramas.com/IRM for the latest news and downloads.

RAMAS®
IRM
version 1.0 beta

by
Applied Biomathematics®

Population Dynamics

Totally Stochastic

Applied Biomathematics® has built its reputation on Monte Carlo simulations of finite populations that are used around the world. RAMAS® IRM version 1.0 brings this experience to bear on agricultural pests with stochastic population dynamics structured by stage, sex, genotype, crop, and field.

Build a Pest

The flexible life history constructor allows you to build a uni- or multivoltine pest that encounters different crops in each generation. Vary the order of mating and reproduction by sex. Specify density dependence and thresholds for pesticide application to explore implications for resistance management.

Population Genetics

Recombine

In RAMAS® IRM version 1.0, recombination is explicit, freeing models from the assumption of Hardy-Weinberg equilibrium. Optional sex-specific recombination and gene linkage further help you understand how IRM tactics will affect target species.

Up To Three Genes

Model major genes for up to three toxins or investigate major/minor gene systems for a single trait. Allow selection to vary across multiple crops present in the landscape. Link the strength of selection to environmental variability through a dose-response function. Specify initial gene frequency, mutation rate, dominance, and cross resistance.

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Adaptation Risk

Probabilistic Outputs

The durability of a crop protectant cannot be known precisely. It is, in part, the product of irreducible uncertainty in the natural world. That is why RAMAS® IRM summarizes results in terms of risk. Durability is displayed as the probability of the loss of susceptibility over time, allowing decision-makers to easily consider both median and tail risks.

Biological Grounding

Along with the standard benchmark of 50% gene frequency, RAMAS® IRM provides a biologically-grounded definition of resistance (adaptation risk), interpreted as the risk of pests achieving positive population growth on protected crops. Adaptation risk is unambiguous even in the presence of cross resistance, larval dispersal mortality, or tradeoffs.

Agricultural Landscapes

Infinite Variety

Real agricultural landscapes are mosaics of crops, phenologies, IRM tactics, and environmental conditions. Capture this complexity with RAMAS® IRM version 1.0 by modeling the co-occurrence of unlimited user-defined cropping strategies, including within- and between-year crop rotations. Include conventional and transgenic varieties of the same crop to model the effect of incomplete adoption. Add non-host crops, trap crops, and fallow fields.

Landscape Uncertainty

Every replicate simulation draws a new random landscape that is then varied through time. Control the frequency of crop varieties and their rotations. Choose what refuge configurations to plant. Define spatial and temporal variation in conditions that affect trait expression. Risk results incorporate the significant uncertainty arising from landscape-level patterns.

Spatial Dynamics

Tailored Movement

RAMAS® IRM version 1.0 uses an intelligent two-tiered approach to compute baseline rates of dispersal, minimizing artifacts of the interplay between dispersal distance and spatial resolution. Specify the unit of time and number of time steps over which dispersal takes place. Vary retention rates by crop. Allow sex-specific mate attraction. Guarantee a minimum spatial resolution. Movement is stochastic and influences both demographic and genetic drift.