Resistance Action Committees: Successfully Implementing Product Stewardship

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Resistance Action Committees

- Clearinghouse for information on resistance management (RM),
- Encourage best management practices,
- Coordinate of basic research into resistance development
- Design and implement management strategies.
- Educate stakeholders

Science is Crucial

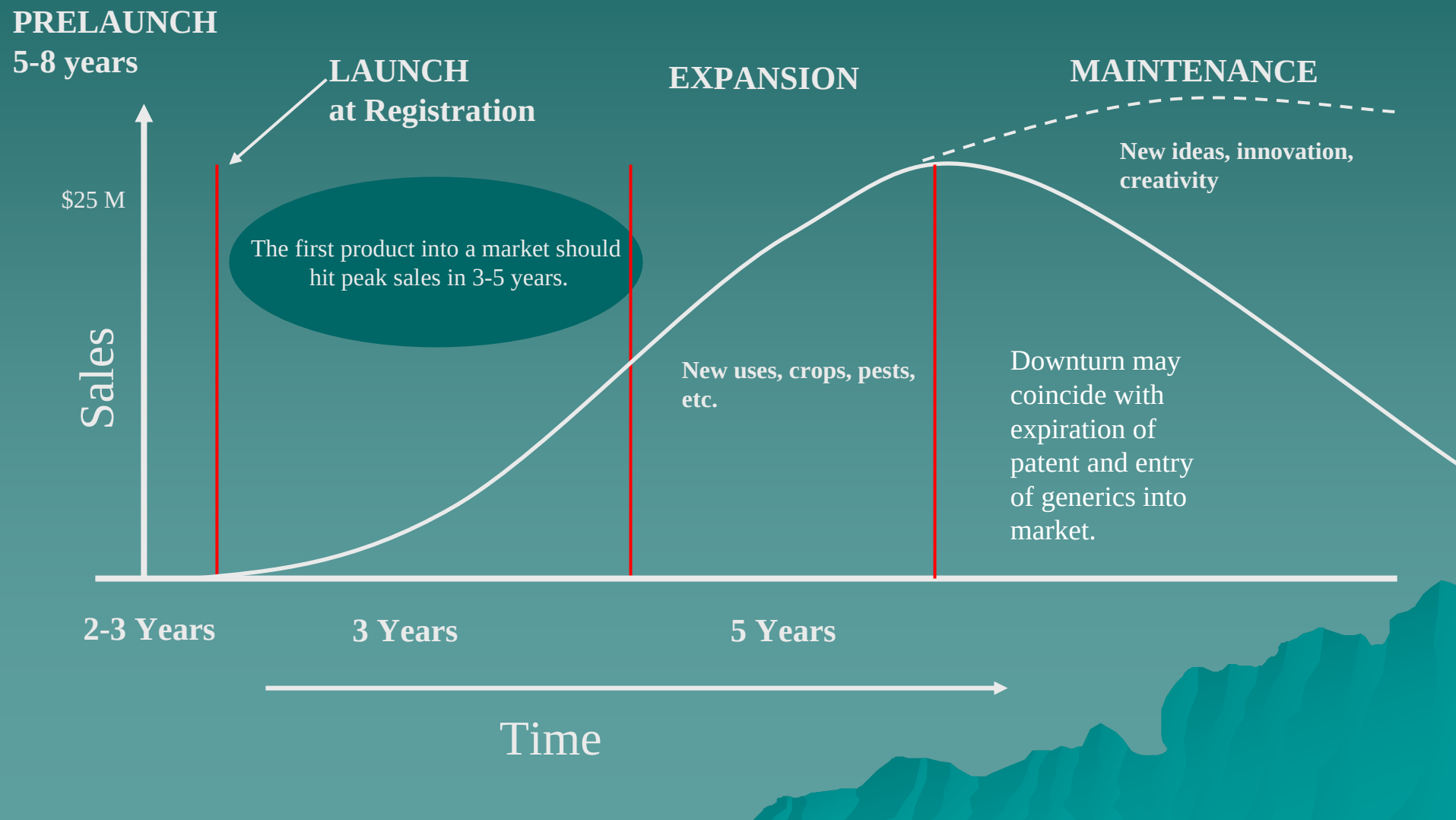
- We cannot manage the development of resistance without sound knowledge of the pathogen, the chemistry, and the process of resistance.
- Current recommendations manage SELECTION PRESSURE
  - Cultural control
  - Application rates
  - Limiting exposure - fewer sprays
  - Alternation of mode of action

Nearly all recommendations limit the amount of fungicide that may be applied to a growers field.

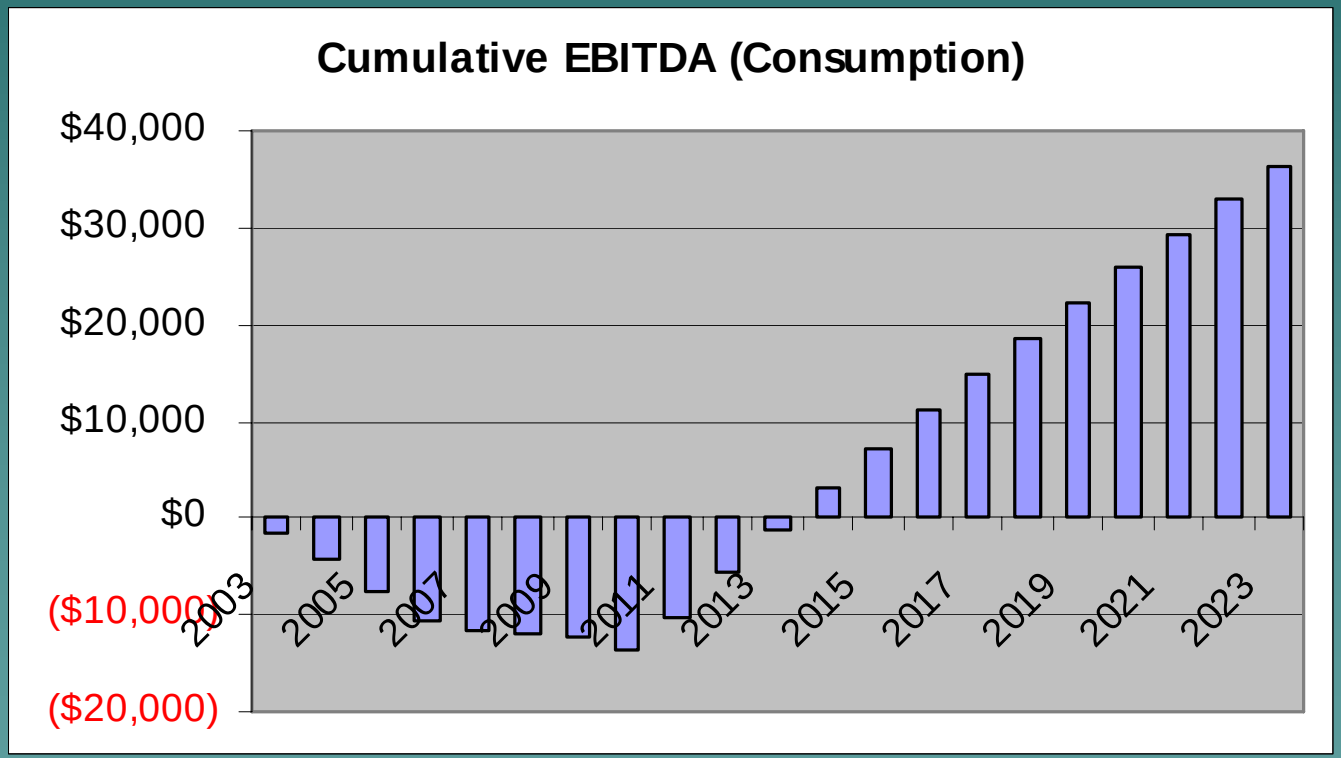
Resistance management reduces the potential sales of a pesticide

Why then, are the RAC's strongly supported by Industry?

4 Phases of the Product Life Cycle



Costs and Return at 100% Share Sales peak at $22 million/year



1.3 Million acres planted

4 spays/year is max allowed

5.1M treated

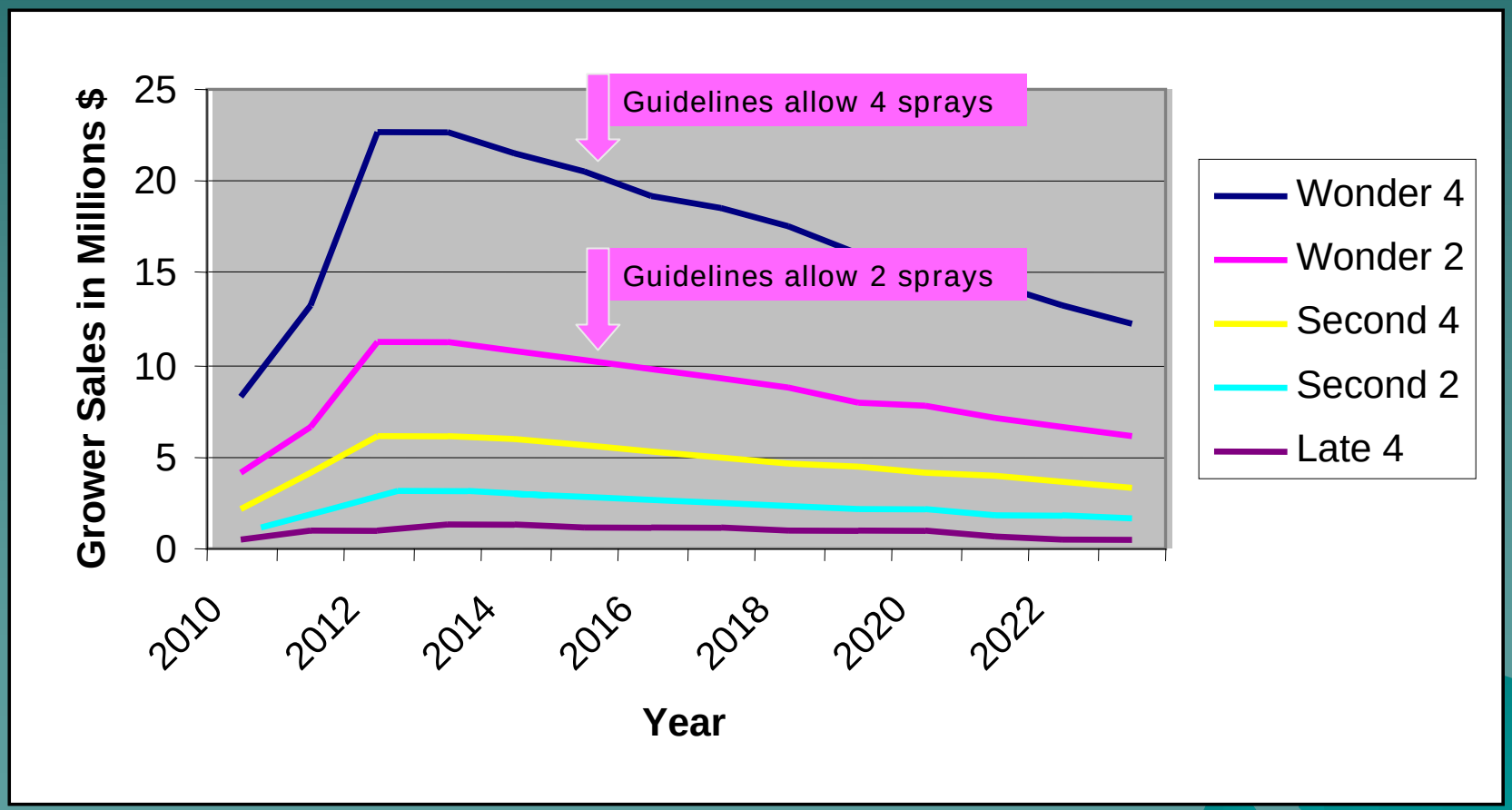
$20/acre

0.25 lb/ai/A

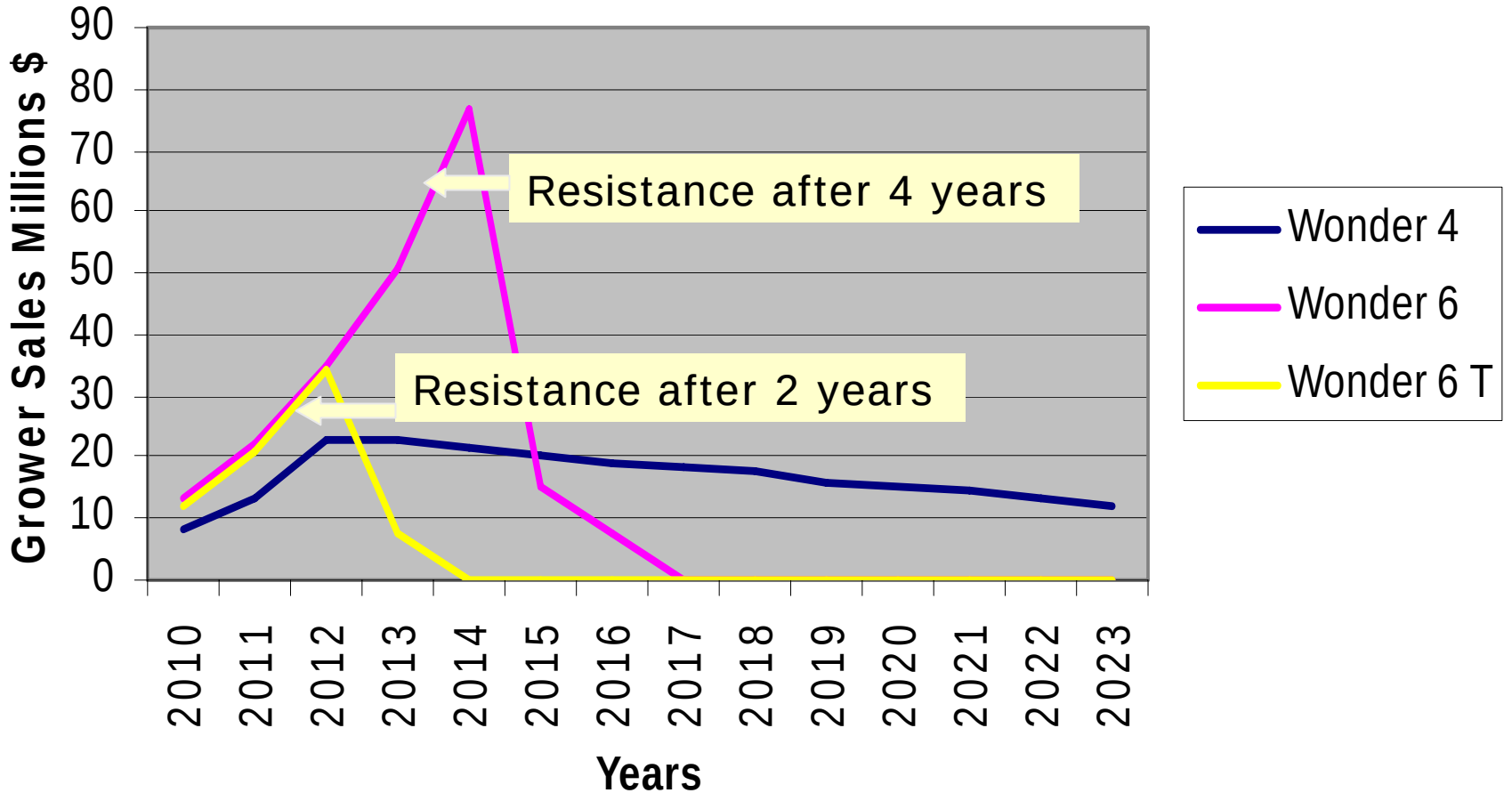
1. EBITDA = Earnings Before Interest, Taxes, Depreciation, Amortization

2. Typical partial costs of new pesticide development, USA only. (000's)

New Resistance Management Guidelines Projected Grower Sales with 2 or 4 Sprays



What happens if Resistance hits?
Grower Sales with Resistance



Net Present Value with and without Resistance / Guidelines

	# Sprays	Peak Sales Millions	Years to Resistance	NPV Millions
Wonder	4	23	13	18
Wonder	2	11	13+	9
Wonder	6	50	6	28
Wonder	6	34	4	11

Resistance management reduces the value of a product, but it also reduces the risk of catastrophic loss.

Conclusions

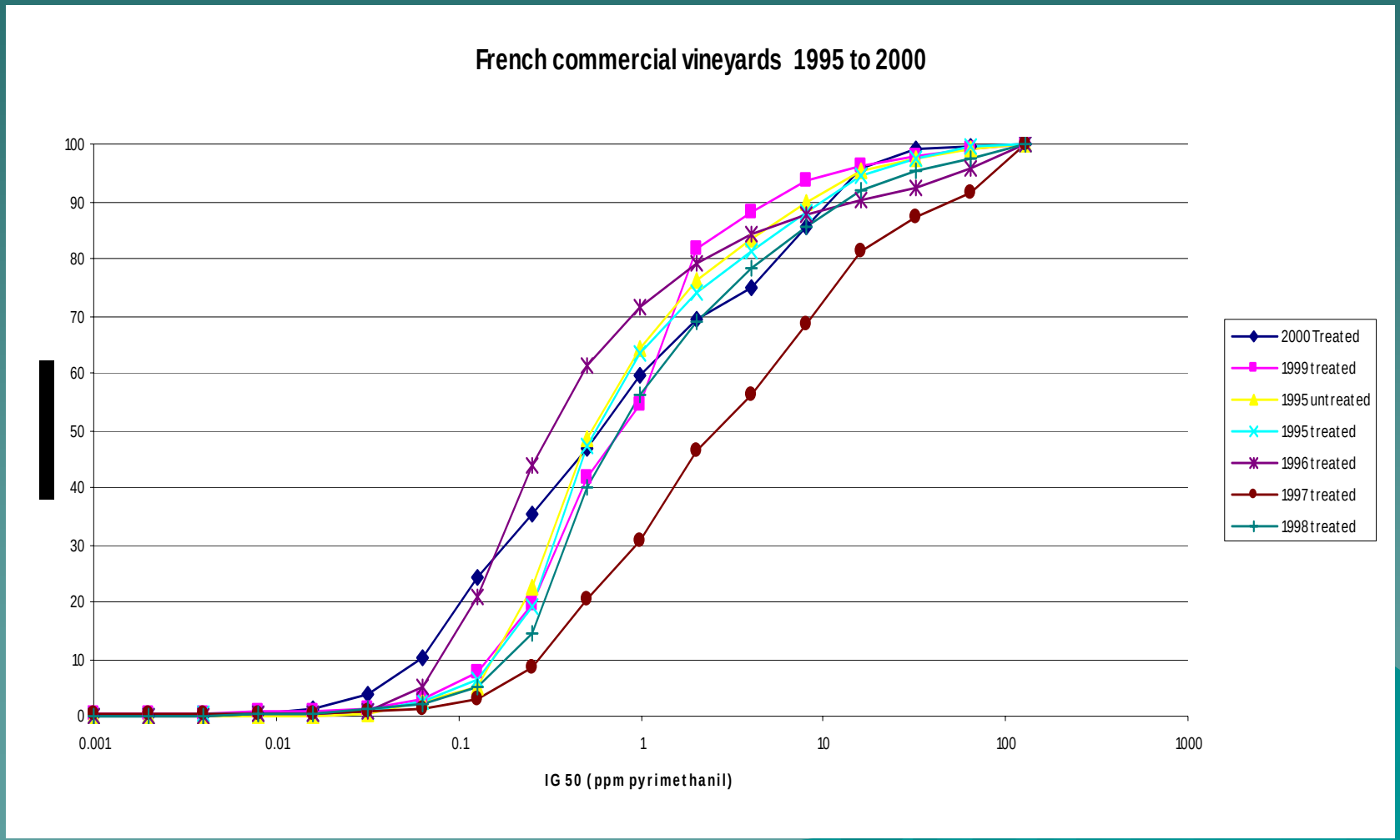
- If risk is high, resistance management is always preferred.
- When market size is small, resistance management is essential. (Important for late entries into the market.)
- Reducing market size will drive products from the marketplace.
- Different people see different futures.
- The models work only if the customers adopt the guidelines.

Objectives and activities of RAC's

- RAC's Working Groups
- Mode of Action Groupings
- Communication efforts
  - Grower talks and education publications
  - Funding for commodity groups (NPC guidelines)
  - Displays at Conventions and meetings
  - Internal publications and education
- Support research into Resistance Management
- Monitoring efforts and development of baselines (sugarbeet, potato, peanut, turf, wheat

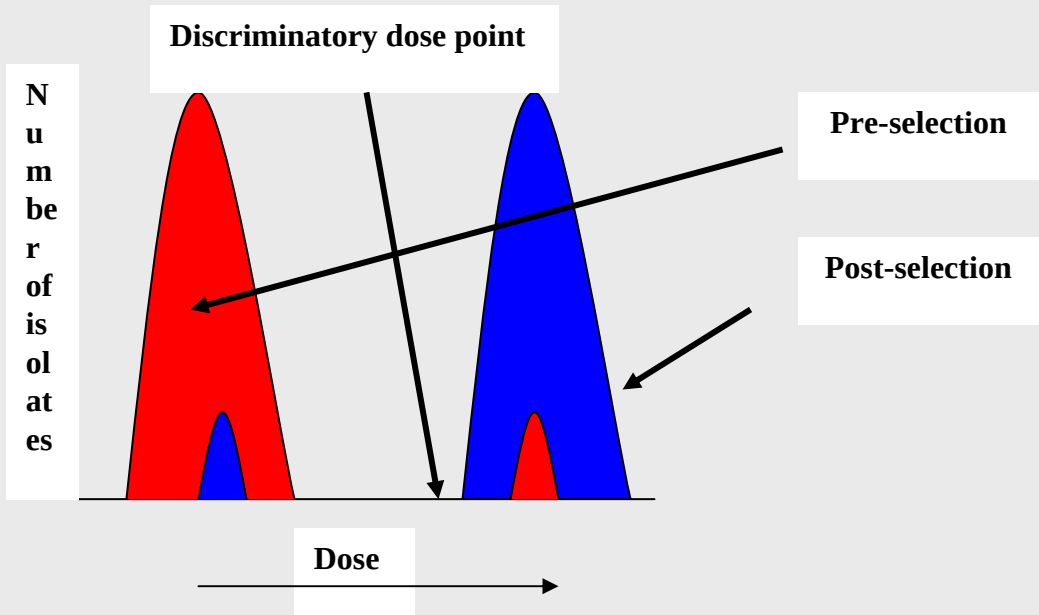
Some populations are very diverse:

Example - Pyrimethanil Botrytis on Vines



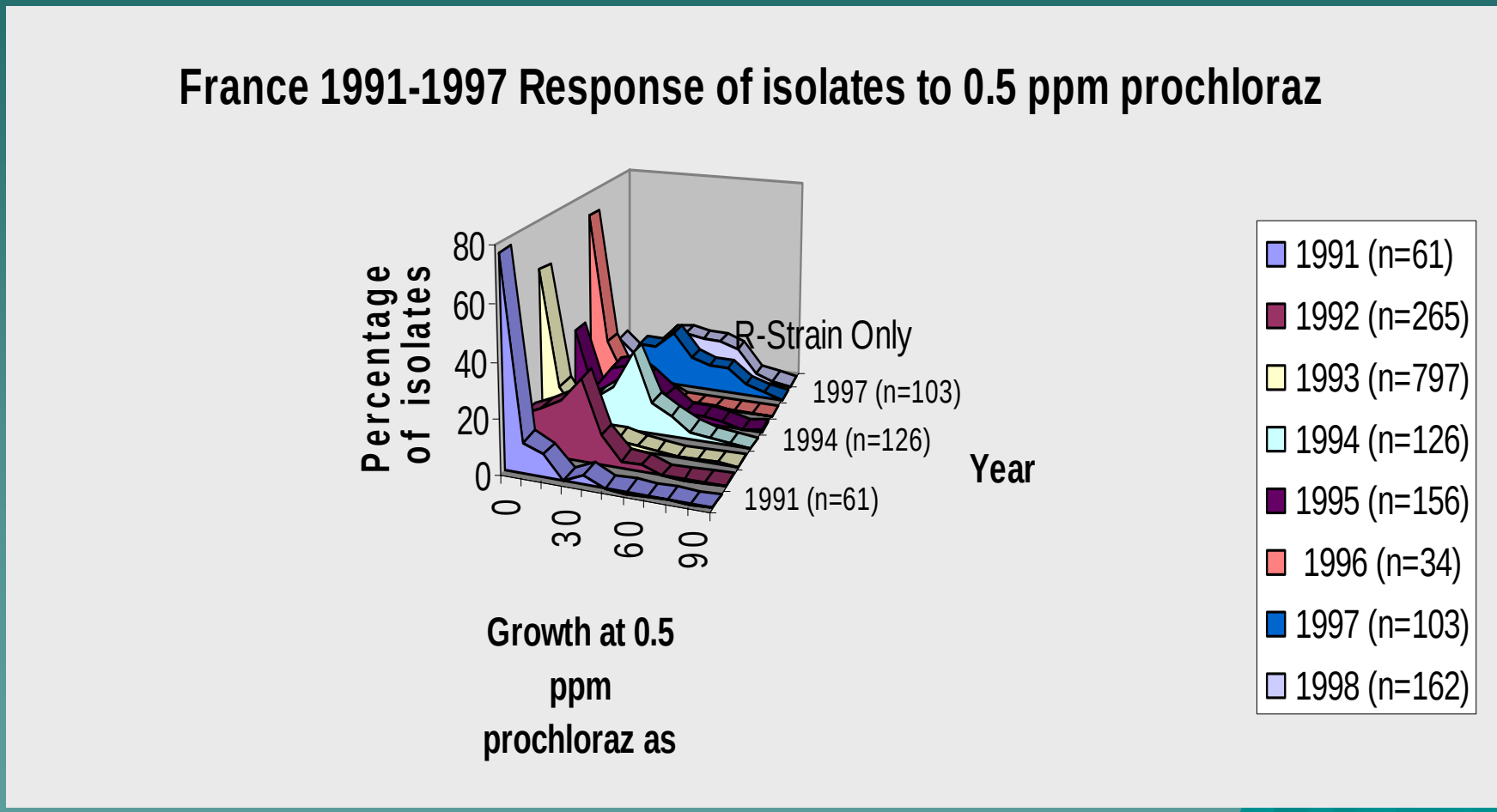
Disruptive selection

Most common with Single gene mode of action

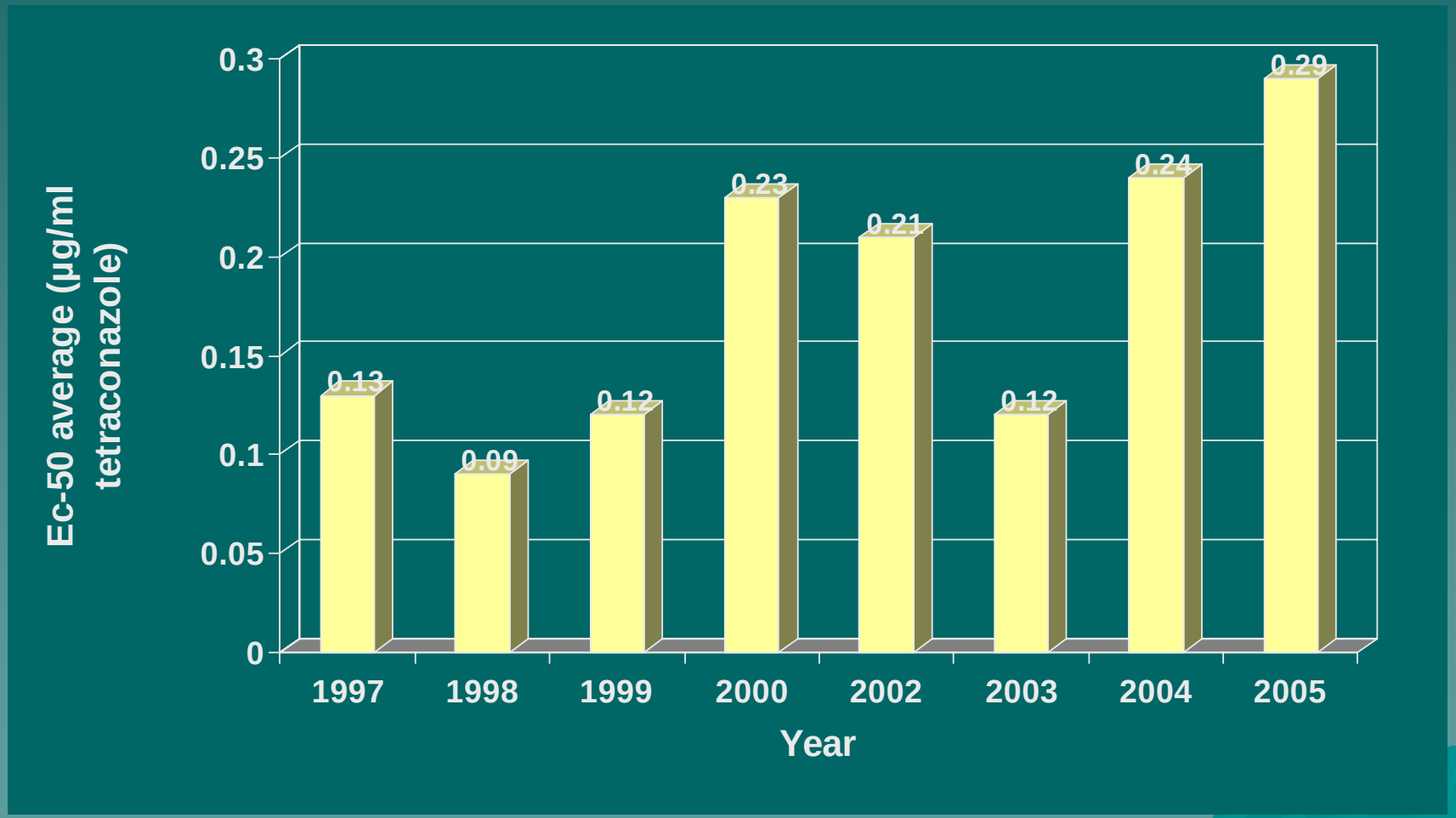


Illustrating disruptive selection. Pre-selection the majority of the fungal population is sensitive with a minority resistant. Post-selection the majority is resistant. There is a clear demarcation between sensitive and resistant.

Shift in sensitivity seen with DMI

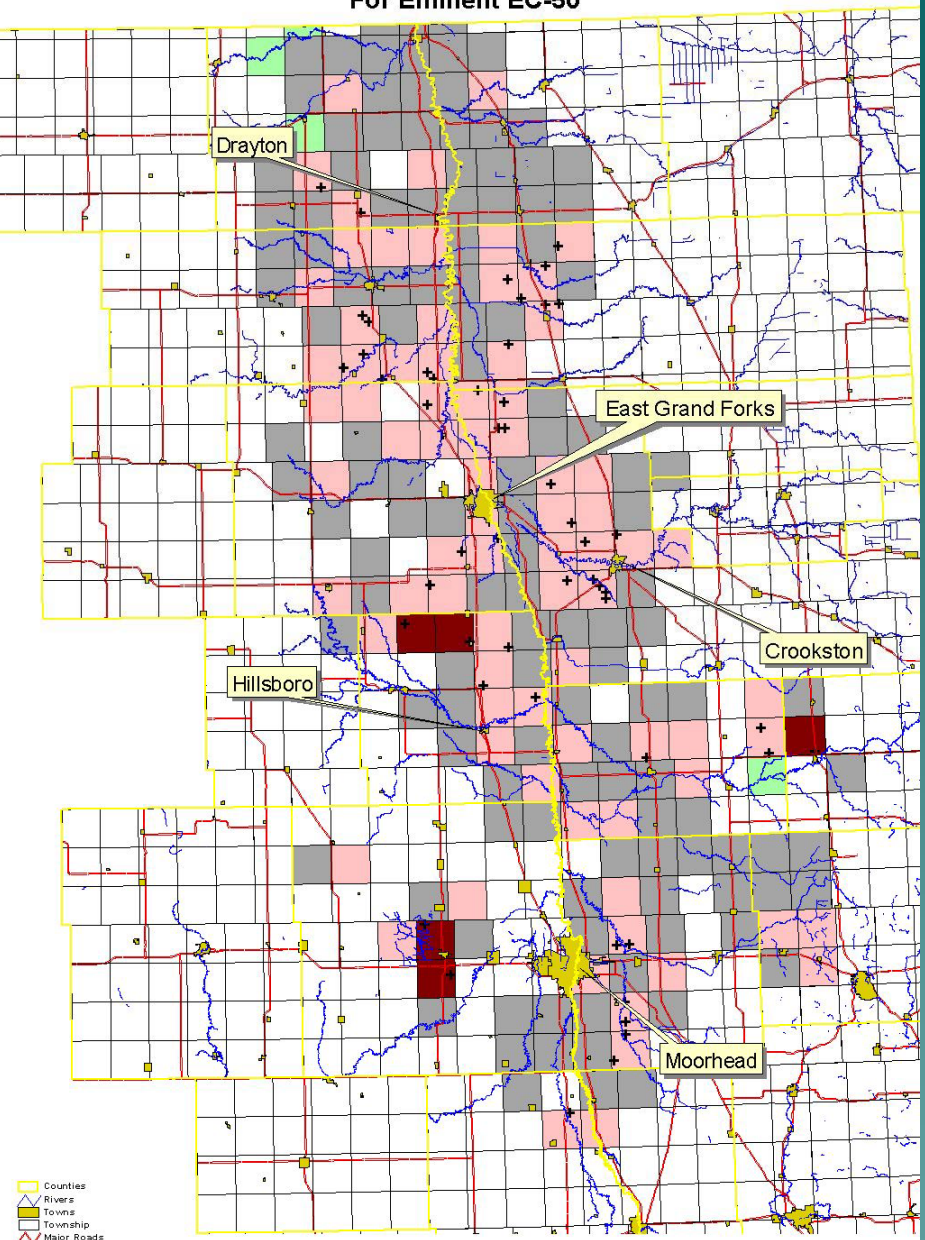


Average EC-50 value of *Cercospora beticola* isolates collected from 1997-2005 to tetraconazole

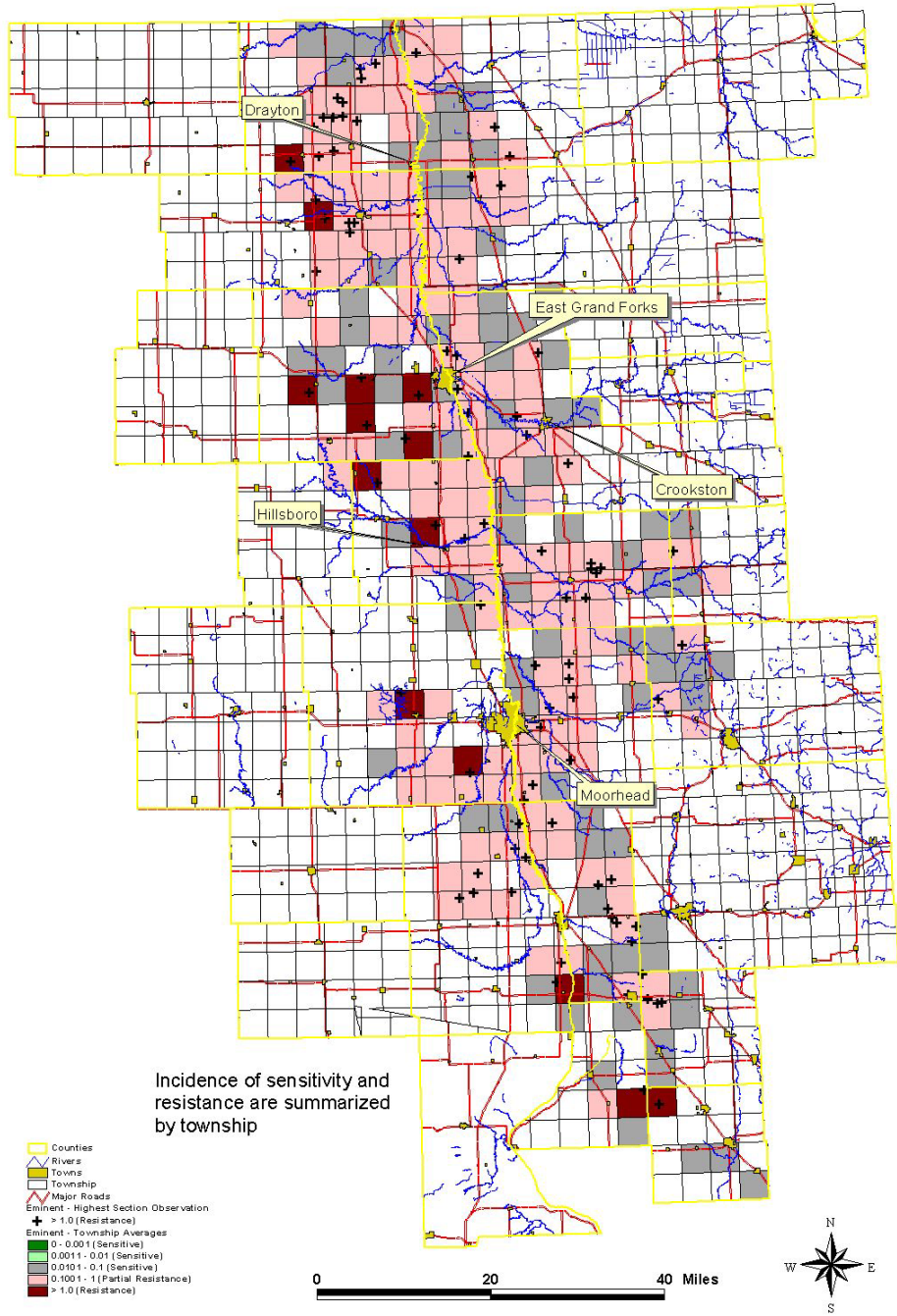


Sugarbeets - Data from Gary Secor, NDSU

Cercospora Sensitivity/Resistance - 2003
For Eminent EC-50



Cercospora Sensitivity/Resistance - 2004
For Eminent EC-50



What does a Salesman do when called out on a complaint?

or

Why didn't it work as expected?

POSSIBLE CAUSAL FACTORS

- Fungi susceptibility (resistance?)
- Rainfall or irrigation timing
- Early vs. late leaf spot (shifts in pathogen population or error in identification of primary disease)
- Weather conditions extremely favorable for disease development

Resistance Management is Integrated Pest Management

Resistance Management is about sustainable agriculture and reducing business risk