



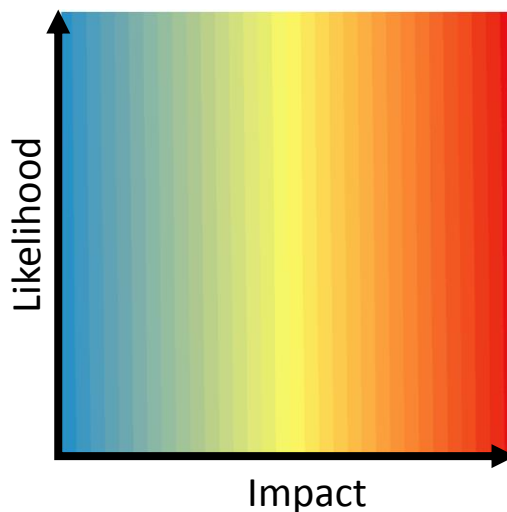
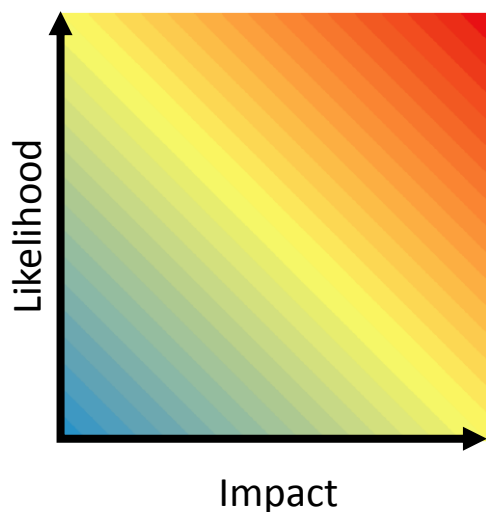
United States Department of Agriculture

Animal and Plant Health Inspection Service

# A pest risk ranking model for exotic pests in the USA

Plant Epidemiology & Risk Analysis Laboratory  
Center for Plant Health Science & Technology

# Risk = Likelihood × Impact



A **HIGH** impact pest with a  
**LOW** likelihood of introduction

=

A **LOW** impact pest with a  
**HIGH** likelihood of introduction

A **HIGH** impact pest with a  
**LOW** likelihood of introduction

≠

A **LOW** impact pest with a  
**HIGH** likelihood of introduction

By focusing on those organisms that we determine have a high probability of causing serious impacts, we can free up resources that can then be spent on those pests that will inevitably surprise us.



# How should pests be prioritized?

Pest Risk

## Consequences of introduction

- Is the pest likely to cause **serious impacts** upon introduction & spread

## Likelihood of introduction

- How likely is the pest to enter the United States, **establish a viable population & spread?**

## Feasibility and Cost Effectiveness

- Is it **possible** to survey for the pest?
- Do the expected impacts of the pest justify the **cost** of a survey program?

## Policy considerations

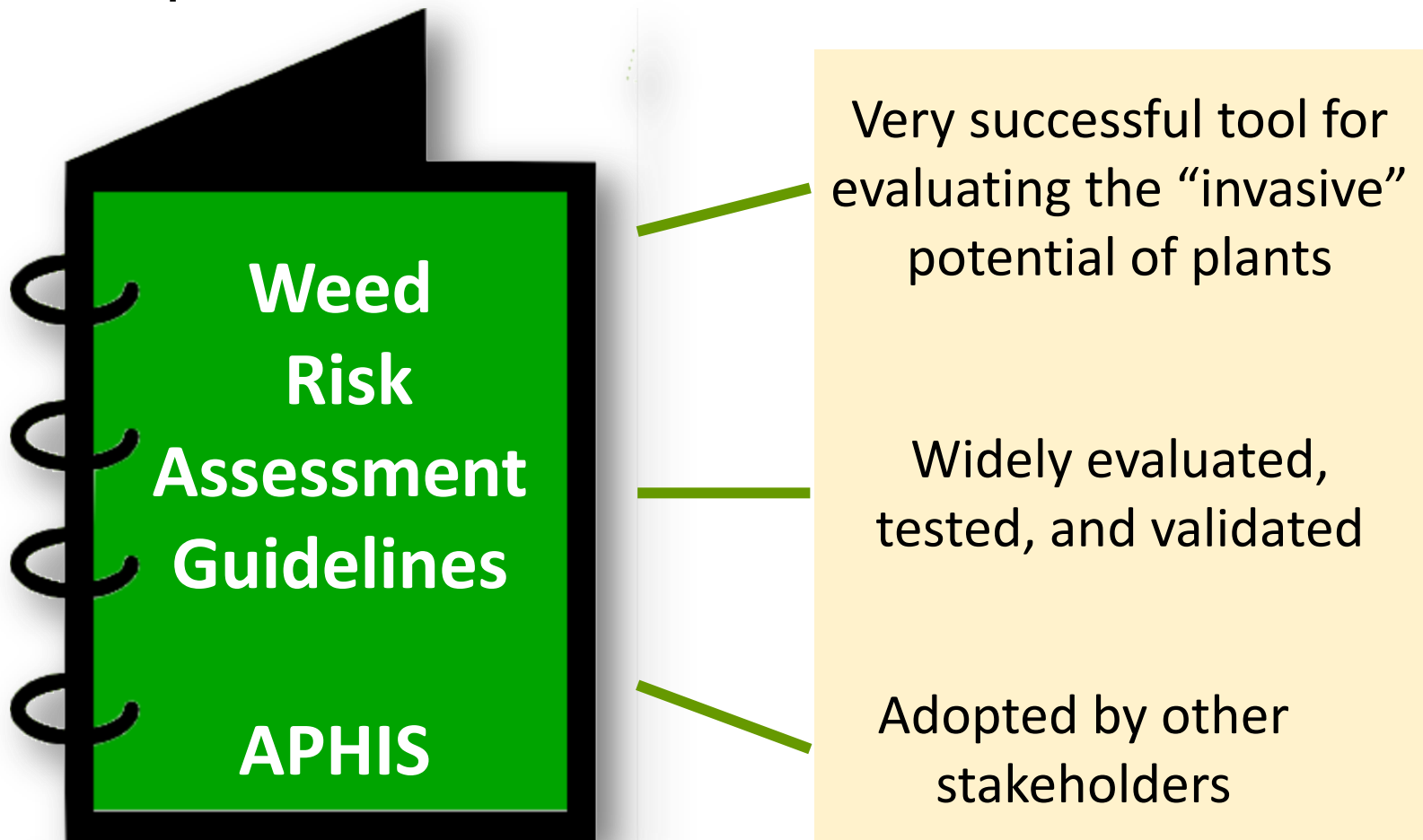
**Phase I:**  
Completed  
(working on validation)

**Phase II:**  
To be completed  
FY 2018

**Phase III:**  
To be completed  
FY 2019



# Template: Weed Risk Assessment Model



# Model Development

## Scoring

Developed a scoring system based on how predictive each variable (question) is; the most predictive variables receive the greatest weight.

## Factors for evaluating US Impacts

Severity of unmitigated damage  
(e.g., yield loss, mortality)

Frequency of severe outbreaks

Impact on production practices

Environmental & social impacts

Level of management & cost of control

Amount of research into methods of control (incl.  
host resistance/ biocontrol)

Ease of control

## Consideration of US Conditions

Are there already organisms in the US  
that fill the same ecological niche?

Are there tools in the US that have  
already been developed and are in use  
that would be effective at controlling  
the pest?

Would current production practices or  
conditions in the United States be  
effective at mitigating the pest?

# Results

Best predictor of pest behavior in the United States is behavior outside the US and the level of control/ research on the organism

Specific biological characteristics are not as important in predicting impact\*

If a pest has not been introduced into a novel area, we may not be able to make a prediction

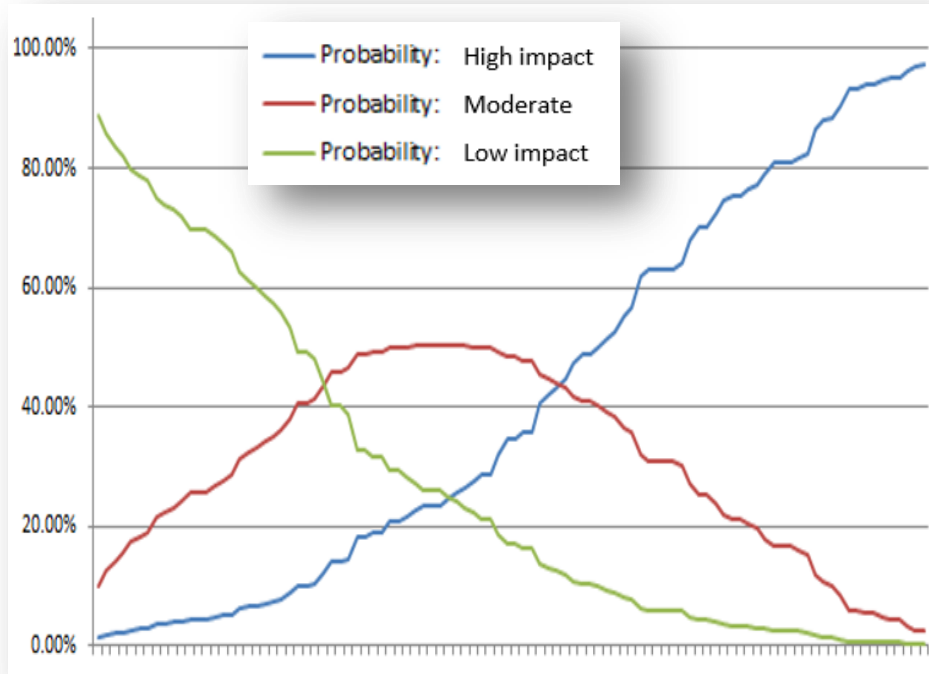
Number of hosts was not found to be related to impact

Ability to survive harsh conditions was not found to be related to impact for pathogens

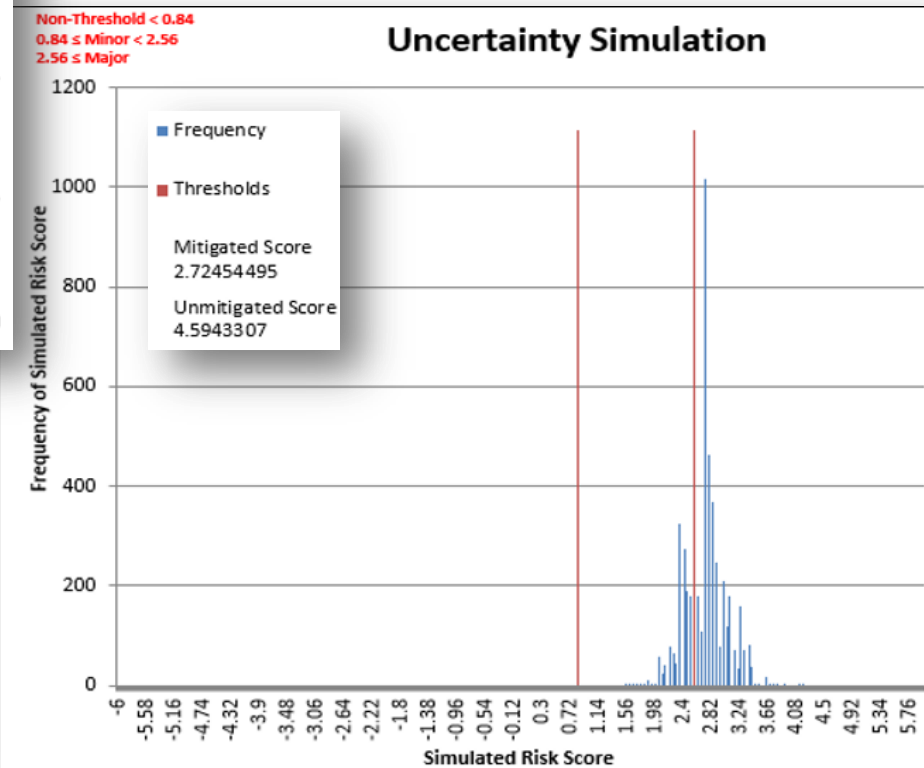
Pathogens tended to be rated higher because of the removal of questions about host range and other arthropod-centric questions (e.g. reproductive potential)

Arthropods tended to rate lower than before because of consideration of management practices already in place

# Impact Likelihood and Uncertainty Analysis



Ordinal logistic regression



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# Pest Prioritization Modeling Team

- **CPHST – PERAL & NCSU Cooperators**

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- **Statistician:** ByeongJoon Kim

- **CPHST CAPS Core Team**

- Lisa Jackson, Melinda Sullivan, Daniel Mackesy, Talitha Molet

- **Others**

- APHIS-PPD, CIPM Cooperators