Determining pest risk

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Overview

- Seed PRAs are based on:
  - ISPM 2 *Framework for pest risk analysis;*
  - ISPM 11 *Pest risk analysis for quarantine pests;*
  - ISPM 21 *Pest risk analysis for regulated non-quarantine pests;*
  - ISPM 38 *International movement of seed.*
- What is the process for determining pest risk?

Do any pests follow the pathway?

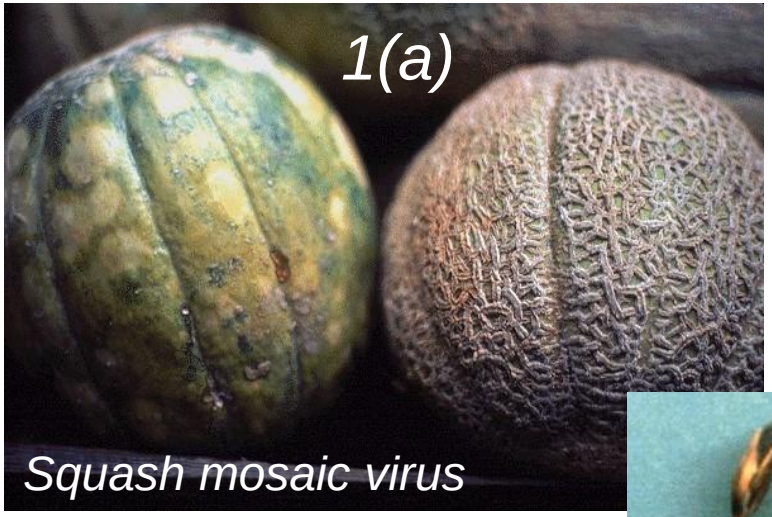
Gummy stem blight (*Didymella bryoniae*)

As defined in ISPM 38:

- The plant (and its seed) is the pest (i.e., Noxious weed).
- Seeds are a pathway for the pest(s).
  - *1(a)* Pests are carried internally or externally and directly infect the host;
  - *1(b)* Pests are carried internally or externally, are transferred to the environment and then infect a host;
  - *2* Pests are contaminating a seed lot.

Image from aps.net.

Seed is a pathway – what next?



Images by T. Zitter, ISU, and siu.edu

How do we determine the pest risk?

- We consider the following factors:
  - The probability of pest introduction and spread;
  - The potential economic consequences from the pest;
  - How confident we are in the data (uncertainty).
- The final conclusion (risk rating) is based on all of the factors.

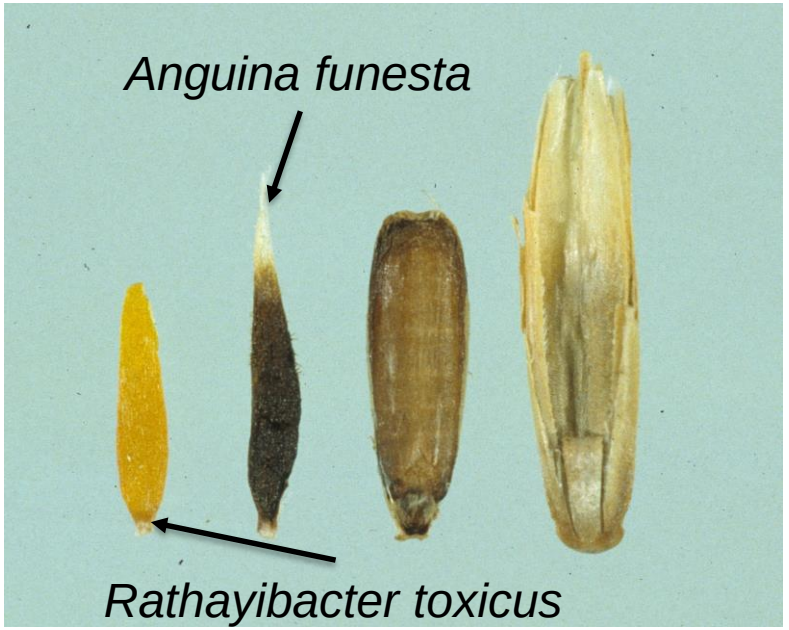


Image from Riley et al, 2008, Austral Pl Path, 37, 289-297

What is at risk?

Identify the endangered area

- Is there a suitable climate for the pest?
  - Where is the pest found worldwide?
- Are there potential hosts at risk?
- Are the hosts economically important?
  - This includes environmental hosts.
- What is the pest potential on the economically important hosts?
- Could the pest spread if it were introduced?

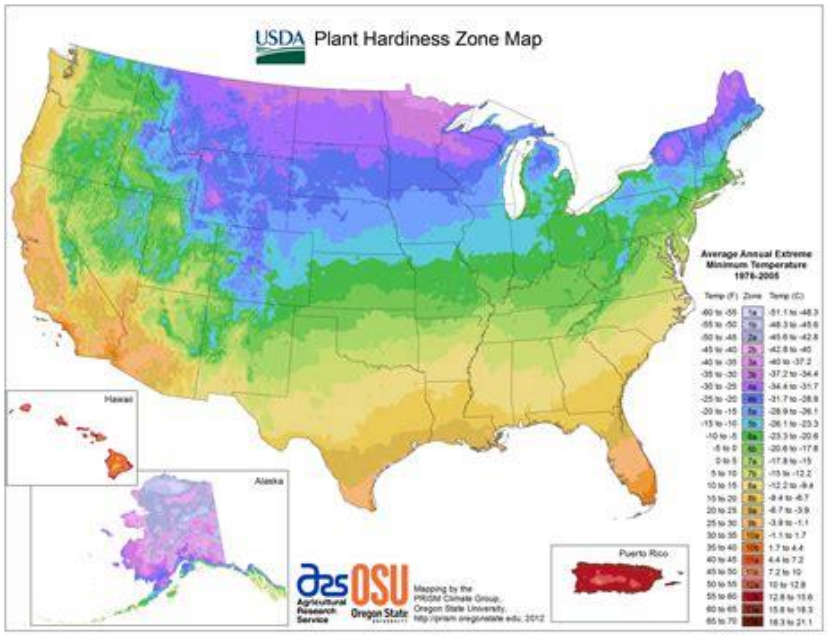
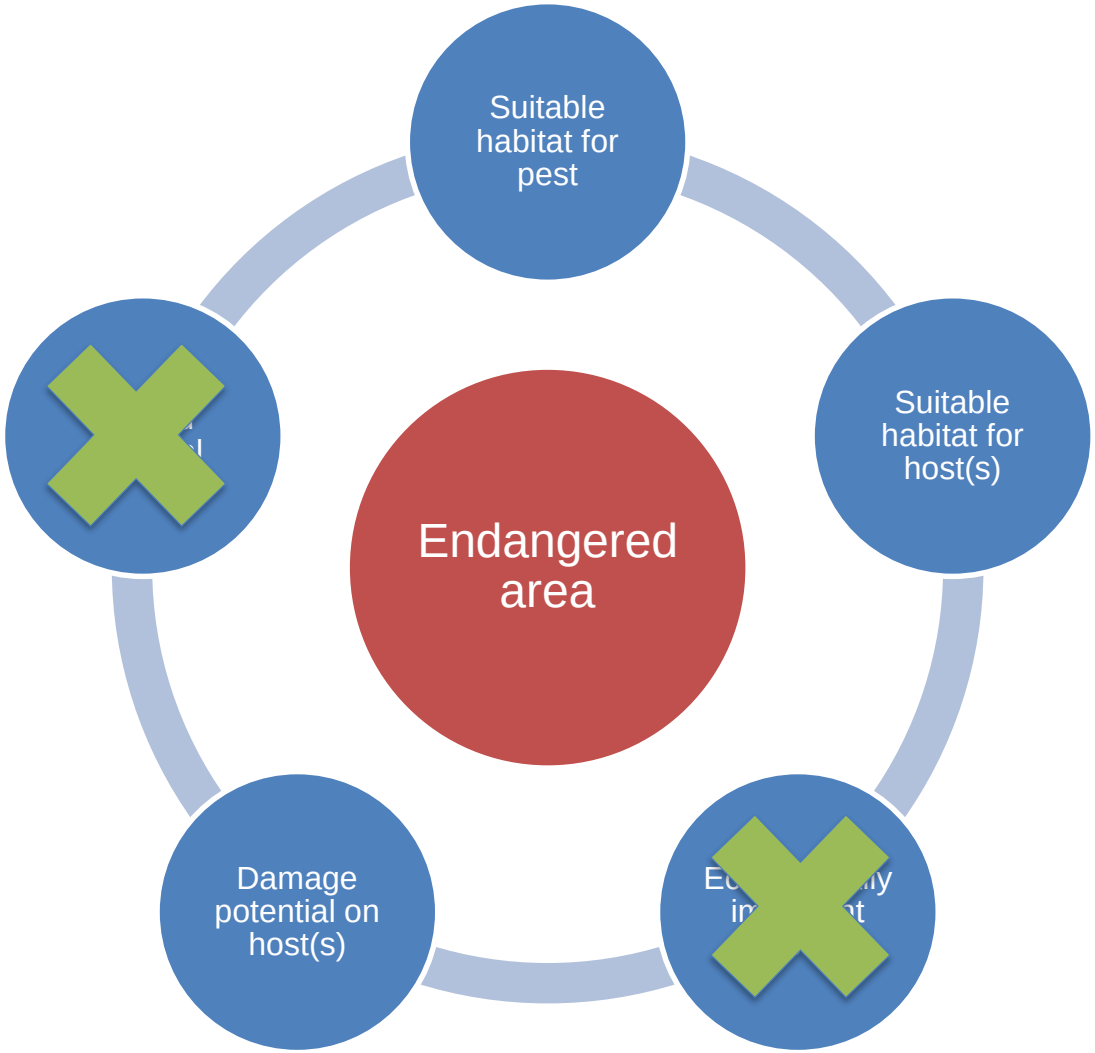


Image from USDA-ARS & Oregon State University



If one or more of these factors are missing, there may be no endangered area for the pest.

What is the likelihood of introduction?

Likelihood of entry + Likelihood of establishment = Likelihood of introduction


+

=


Images by asiafarming.com, oldworldgardenfarm.com, and greenhousecanada.com

Likelihood of Entry

The initial risk is based on the pest's prevalence on the harvested commodity.

The risk rating may be adjusted because of post-harvest processing (↑, ↓, or no change).

The risk rating may be adjusted again because of shipping conditions (↑, ↓, or no change).

If this is greater than your country's acceptable level of risk, continue with the assessment.

Determine the final risk rating for likelihood of entry.

For seed-transmitted pests, the likelihood of establishment is always a risk!

Pseudomonas savastanoi pv. *phaseolicola*

Seed transmission rate = 1.8 – 3.0%

Likelihood of introduction

Likelihood of establishment is usually high because:

- The pest is introduced with its host;
- The host will be planted where it can grow.

Likelihood of entry	Likelihood of establishment: Low	Medium	High
High	M	M	H
Medium	L	M	H
Low	L	M	M

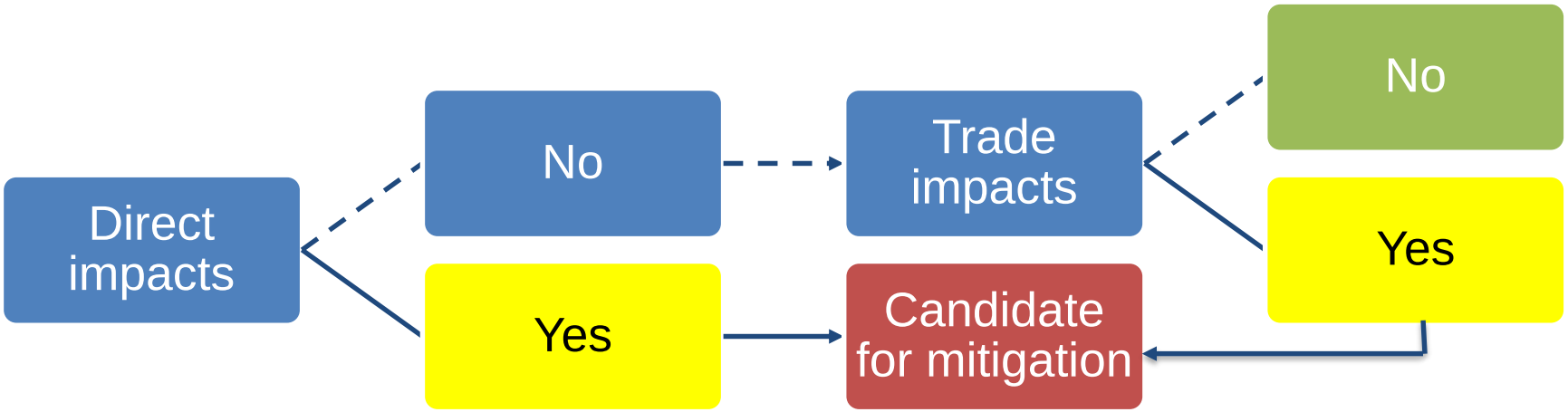
One example of a Likelihood of Introduction decision matrix.

What are the impact(s) of introduction?

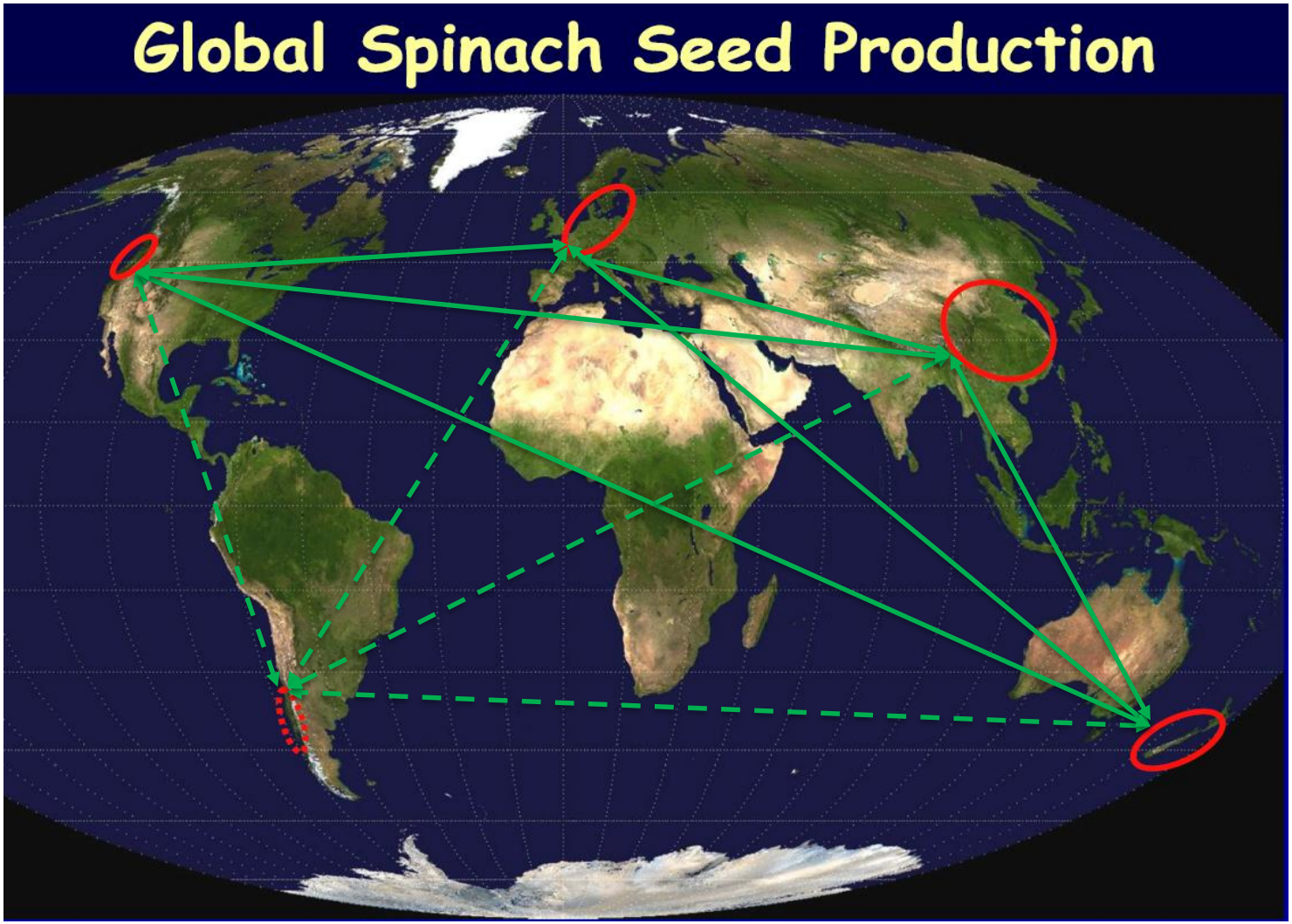
- Direct impacts
  - What is the damage potential in the endangered area?
    - What effect will the pest have on economically important hosts?
    - Will the pest increase farmer's production costs?
- Indirect impacts
  - Who do we export the host commodity to?
  - Are our trading partners concerned about the pest?
    - Will they adopt new requirements because of the pest?

Image by N. Osterbauer

Identifying a candidate for mitigation



Seed moves globally; this complicates how we assess risk.



Modified from du Toit, 2018

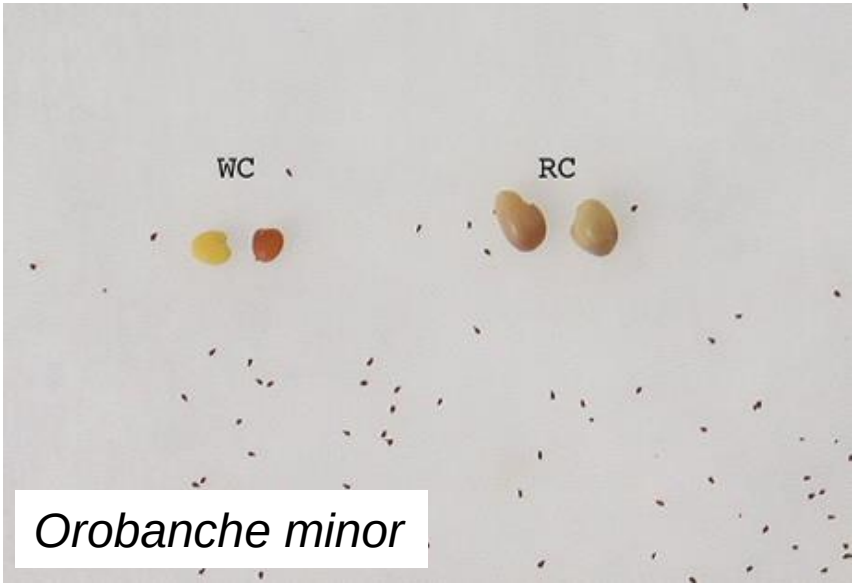
Other sources of uncertainty

- Lack of information about the pest.
  - Contradictory evidence.
- The pest behaves differently depending on the host or cultivar.
  - Some hosts are asymptomatic;
  - The pest may be seed-borne in one host and not the other;
  - Some host cultivars may be resistant.
- The pest has inconsistent or low seed transmission rates.
- Seed treatments affect the pest's seed transmission rate.
- Et cetera…

Image from forestryimages.org.

USDA's approach

- Global seed PRAs
  - We focus on:
    - One host species;
    - Absence or presence in the USA
    - What pest(s) of that host are we concerned about?
      - What classes of pests (e.g., fungi, viruses, …) move with its seed?
      - Do the pests have similar life cycles/biology?
  - We determine the unmitigated pest risk
- These PRAs are then used to inform the Regulatory Framework for Seed Health



Orobanche minor

Image from plantmanagementnetwork.org

Summary

- The seed PRAs follow ISPM Nos. 2, 11, 21 and 38.
- The pests of concern are assessed for:
  - Endangered area;
  - Likelihood of introduction;
  - Economic impacts.
- Seed PRAs present unique challenges. For example:
  - Seed is grown and shipped globally;
  - Information on seed pests may be lacking or contradictory.

Image by N. Osterbauer