Evaluation of evidence and its uncertainty in qualitative pest risk assessments

Marina Zlotina
USDA APHIS, Plant Protection and Quarantine,
Plant Epidemiology and Risk Analysis Laboratory
marina.a.zlotina@aphis.usda.gov

This presentation:

Part 1.

North American Plant Protection Organization (NAPPO)

Part 2.

Evaluation of Evidence and its uncertainty in PRA

Advanced methods and strategies for surveillance and data collection

- RSPM 13 (2009) Guidelines to establish, maintain and verify Karnal bunt pest free areas in North America
- RSPM 17 (revised 2010) Guidelines for the establishment, maintenance and verification of fruit fly pest free areas in North America
- Surveillance protocol for Tuta absoluta (SP 01 – 2013)
- Area wide management of Huanglongbing (in prep)
- Guidelines for development of, and efficacy verification for, lures and traps for arthropod pests of fruit (in prep)
- Criteria for the determination of host status of pest arthropods and pathogens based on existing information (in prep)

Data collection and information sharing for PRA

- Pathway risk analysis (RSPM 31: 2012)
- Pest risk assessment for plants for planting as quarantine pests (RSPM 32: 2008)
- Climate change and pest risk analysis (discussion paper - 2012)
- The current state (2012) of Potato virus Y (PVY) affecting potato grown in North America (ST 01: 2013)
- Pest risk management (RSPM 40 - in prep)
- Status of: *Lobesia botrana*, *Drosophila suzukii* and *Rhagoletis* species (3 documents in prep)
- Taxonomic and molecular identification protocol of fruit *Tetranychus* mites (in prep)

Pest reporting

- Phytosanitary Alert System
  - Official reports from the three NAPPO countries
  - Unofficial reports received globally
  - *Fulfills IPPC obligation for pest reports*
  - Option to subscribe to receive alerts
  - For 2013:
    - 32 official pest reports (14 CA, 17 US, 1 MX)
    - No unofficial pest alerts were posted

North American Plant Protection Organization's

Phytosanitary Alert System

Welcome to the **North American Plant Protection Organization's** (NAPPO) Phytosanitary Alert System!

The Phytosanitary Alert System (PAS) provides up-to-date information on pest situations of significance to North America. This system is intended to facilitate awareness, detection, prevention and management of exotic species in North America. The PAS provides this information in two ways:
1) **Official Pest Reports**
2) **Unofficial Alerts**

"Official Pest Reports" are provided by National Plant Protection Organizations within Canada, the United States, or Mexico. They serve as official communication from the country of origin and are intended to comply with the IPPC Standard on Pest Reporting (ISPM No. 17).

"Alerts" are news items obtained from public sources. They do not serve as official communication from NAPPO. In most cases, information within alerts is not confirmed with the corresponding National Plant Protection Organization. They are provided solely as an early warning to NAPPO countries and should be used with this disclaimer in mind.

Free subscriptions are available for periodic email notifications of new postings to the website.

Recent Posts:

- Citrus Canker (*Xanthomonas* spp.) quarantine established in Louisiana - **02/14/2014**
- Coconut Rhinoceros Beetle (*Oryctes rhinoceros*, Scarabaeidae) detected in Hawaii - **02/06/2014**
- Updated regulated areas for the Emerald Ash Borer (*Agrilus planipennis*) - **01/23/2014**
- APHIS establishes additional regulated area in Florida for Giant African Snail (*Lissachatina fulica*, formerly *Achatina fulica*) - **12/24/2013**
- December 2013 Report: Emerald Ash Borer Found in New Locations in Ontario and Québec - **12/23/2013**

Email this site to a friend

Alert
Canada Official Pest Report
United States Official Pest Report
Mexico Official Pest Report

Medfly (*Ceratitis capitata*) by Scott Bauer, USDA Agricultural Research Service, www.bugwood.org

Part 2: Evaluation of Evidence

1. SPS Agreement and role of evidence in risk assessment
2. Risk and uncertainty
    a) Uncertainty in PRA
    b) Types of uncertainty
    c) Separating risk and uncertainty
    d) Expert judgment and evidence
3. Quality of evidence
    a) Variability of information and good practices
    b) Reliability of information
    c) Applicability of information
    d) Extrapolation and uncertainty
    e) Framework for evaluation of information (APHIS-PPQ)

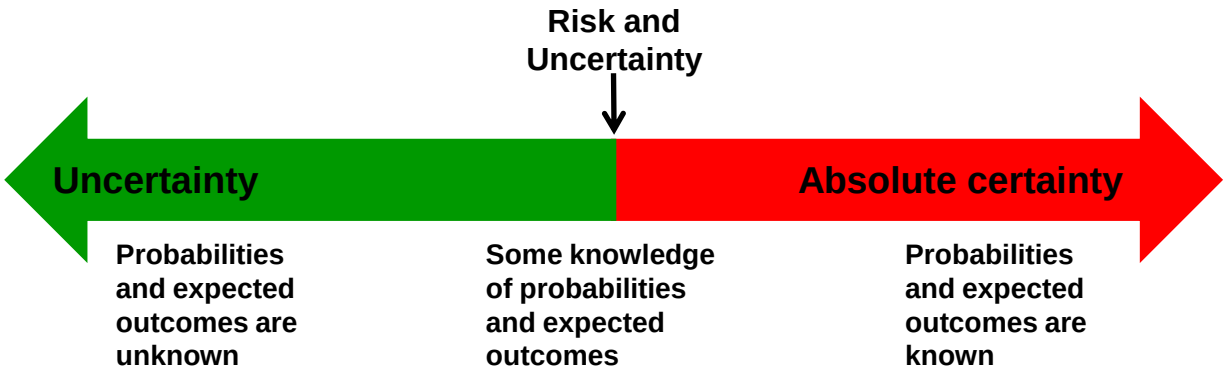
We've got data! Now what?

- Remember: not all data are created equal

- The SPS Agreement does not set a requirement for the minimum amount or quality of information needed to make a judgment. Rather, the Agreement states that measures should be based on available information.

Risk and Uncertainty

- Uncertainty is built-in to the concept of risk; without it, the term "risk" does not apply.
- That is, if the probability and the consequences of a particular hazard are known with certainty, there is no risk.



Uncertainty in PRA

- Uncertainty in PRA is typically much more extensive than uncertainty in other SPS areas

- Thousands of potential pests, hundreds of potential host commodities, and an unlimited number of possible trade scenarios contribute to the uncertainty in PRA

Some types of uncertainty

- It is important to know the source, type, and degree of uncertainty to completely understand the risk and what can be done to affect it:
  - Insufficient information
  - Variability
  - Imprecision (including error)

WORLD TRADE ORGANIZATION

- In the SPS environment, the role of evidence is emphasized but treatment of uncertainty is not explicit.

- Ideally, risk analysis should clearly separate the evidence from the uncertainty and characterize the degree to which uncertainty influences the judgment of risk

Separating uncertainty from judgment about risk

- Risk estimate should be based only on the available evidence, not the on uncertainty associated with the evidence
  - Given element should not be rated higher if there is a lot of uncertainty;
  - The rating should be assigned based on available evidence and the high level of uncertainty should be noted.

Q: Why data quality is so important?
A: SPS requires risk management to be based on scientific evidence

Difference between a probability and *possibility*

- SPS jurisprudence has demonstrated the importance of establishing rational relationship between the measures and the evidence which must be based on more than just expert opinion of a possibility

Expert opinion must have some basis in evidence

Information can be highly variable based on

- Quality
- Quantity
- Source(s)
- Applicability and relevance
- Reliability

"Yeah, but good luck getting it peer-reviewed."

Reliability of evidence

- Reliability is defined in terms of the quality of the information source, how dated is the information, the methodology used therein, and the degree of consensus in the professional community

Circular references

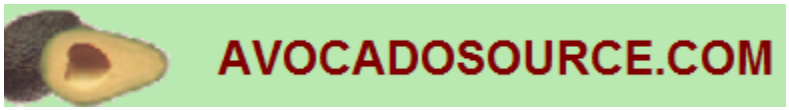
- Historical records of pest presence or absence may not be accurate and up to date
- Such records are often continuously and repeatedly cited in the scientific literature
- Once a record is cited repeatedly, it becomes part of the literature and corrections to such records may be exceedingly difficult

Secondary sources

- Even with accurate original records, the phenomenon of citing secondary sources often leads to erroneous records and conclusions.
- Basing conclusions of a risk analysis on a preciously conducted risk analyses rather than on the original information sources can be detrimental
  - The previous analysis could have had different goals

Non-traditional information sources

- Non-traditional information sources (IPM reports, extension reports, etc.) can be important if multiple independent publications corroborate the same evidence
- Sometimes perceived to be of lower quality, these sources should not be discarded from analysis but should be discussed in relation to uncertainty



CIPM

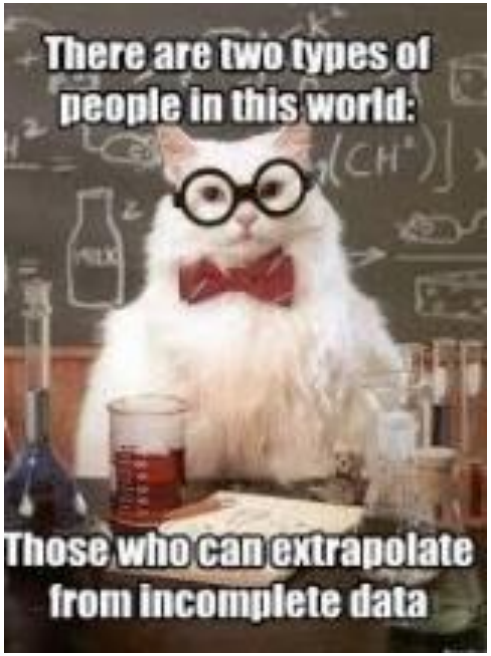
Reliability of evidence: Commodity as a pathway

Baggage vs. Cargo interceptions

Applicability

- Applicability refers to how applicable the information is to your situation.
- Emphasis should always be placed on how the pest behaves in the parts of the distribution most similar to the PRA area
  - Since this information is not always available, we must extrapolate and make assumptions
  - Absence of evidence can be used as evidence

Applicability of evidence: Extrapolation:



Pest occurs in the export area but reported on host species other than the exported commodity. The pest however is also reported to be associated with the commodity in other areas.

- Is it possible that the pest could be associated with the commodity in the export area?

Applicability of evidence: Extrapolation

Pest is reported on leaves and stems of multiple plant species. It was only reported on fruit of *Species A*.

- ❑ Could the pest be associated with the fruit of the other hosts?

Uncertainty and Extrapolation

- Variations in interpretation of evidence and in addressing the related uncertainty can lead to sharply different conclusions in determining pest risk, pest status, host status or any number of similar issues (e.g. efficacy of treatments, efficacy of alternative risk management options)

ISPM 8 (Determination of pest status in an area)

1. Collector/ Identifiers	2. Technical identification	3. Location and date	4. Recording/ Publication
a. Taxonomic specialist	a. Discriminating biochemical or molecular diagnosis (if available)	a. Delimiting or detection surveys	a. NPPO record/RPPO publication (where refereed)
b. Professional specialist, diagnostician	b. Specimen or culture maintained in official collection, taxonomic description by specialist	b. Other field or production surveys	b. Scientific or technical journal refereed
c. Scientist	c. Specimen in general collection	c. Casual or incidental field observation, possibly with no defined location/date	c. Official historical record
d. Technician	d. Description and photo	d. Observation with/in products or by-products; interception	d. Scientific or technical journal non-refereed
e. Expert amateur	e. Visual description only	e. Precise location and date not known	e. Specialist amateur publication
f. Non-specialist	f. Method of identification not known		f. Unpublished scientific or technical document
g. Collector/identifier not known			g. Non-technical publication; periodical/

	Publication source	Reliability	Examples
1	Well-known peer-reviewed journal	Low	No peer reviewed literature available
		Moderately low	Only one or a few; any found do not describe methodology OR methodology used is not widely accepted.
		Moderately high	At least one original research paper with detailed description of methodological approach. Several original research papers without specified methodology. Multiple published review articles; articles cite independent (separate) sources of information.
		High	Multiple original research papers with detailed description of the methodological approach(es) used; approaches are widely accepted.

	Publication source	Reliability	Examples
2	Obscure or less-well known peer- reviewed journals	Low	No original research. Few or no review or summary articles.
		Moderately low	Few or no original research papers; methodology may or may not be described. Multiple published review articles which may or may not cite independent (separate) sources of information.
		Moderately high	Multiple original research papers (with specified methodology).
		High	Many original research papers (by multiple authors) that include a detailed description of the methodological approach(es) used; approaches are widely accepted; supported by other

	Publication information	Applicability	Examples
1	Species-specific data	Low	Species-specific data were limited; most of the species data were approximated or extrapolated from congeneric species, or other similar species.
		Moderately low	Species-specific data were used; some of the species data were approximated or extrapolated from congeneric (or other) species known to behave similarly.
		Moderately high	Species-specific data were used.
		High	Data for both pest and host species were used.
2	Environment-specific data	Low	Environment-specific data were limited; no close proxy data was available; extrapolations were based on situations that may or may not be applicable.
		Moderately low	Some environmental-specific data were used, but most were approximated or extrapolated from similar situations (i.e., research con- ducted in the areas of comparable climate, on a closely related host).
		Moderately high	Some environment-specific data were used, but at least some data were approximated or extrapolated from similar situations (i.e., research conducted in the areas of comparable climate, on a closely related host).
		High	Environment-specific data were used.

Combining applicability and reliability of evidence to obtain uncertainty rating for the information sources

Applicability	Reliability: Low	Reliability: Moderately Low	Reliability: Moderately High	Reliability: High
High	Moderately Uncertain	Moderately Certain	CERTAIN	CERTAIN
Mod. High	Moderately Uncertain	Moderately Certain	Moderately Certain	CERTAIN
Mod. Low	UNCERTAIN	Moderately Uncertain	Moderately Certain	Moderately Certain
Low	UNCERTAIN	UNCERTAIN	Moderately Uncertain	Moderately Uncertain

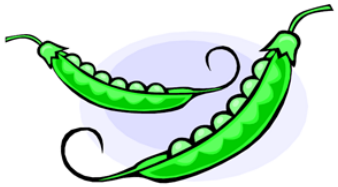
USDA

United States Department of Agriculture

Animal and Plant Health Inspection Service

Plant Protection and Quarantine

Guidelines for Plant Pest Risk Assessment of Imported Fruit & Vegetable Commodities



Agency Contact
Plant Epidemiology and Risk Analysis Laboratory
Center for Plant Health Science and Technology

United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
1730 Varsity Drive, Suite 300
Raleigh, NC 27606

Thank you!