

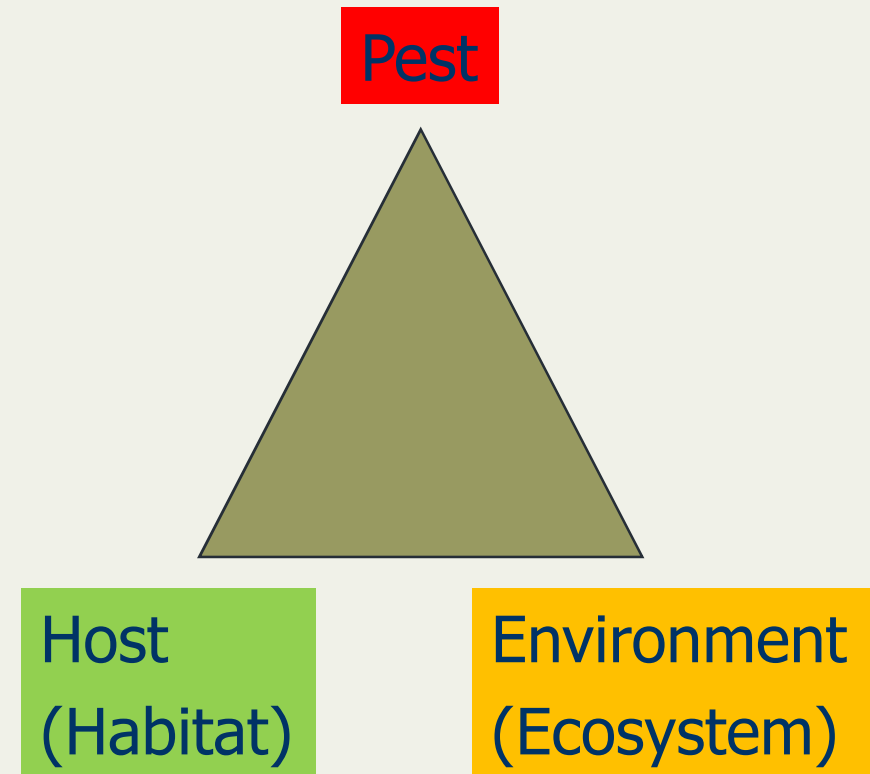


PRA and spread

Julian Smith



- Top questions:
 - Means of spread
 - How?
 - Rate of spread
 - How fast?
 - Magnitude of spread
 - How far?



Spread: Expansion of the geographical distribution of a pest within an area [FAO, 1995]

Understanding probability of spread

- Primary and secondary spread
 - A continuum of entry and establishment events localised within the PRA area
- Rate and magnitude of spread
 - Scale and of potential impacts
 - Defining the endangered area within given timeframes and introduction events
- Defined by a current time period
 - Not based on parameters predicted at some future time e.g. due to climate change
 - Sufficient to take into account between-year seasonal factors e.g. weather variations (probably a retrospective analysis)

Factors effecting spread

- Availability of hosts and alternate hosts
- The biology of hosts and alternate hosts
- Suitability of environment
- Biology of the pest
- Presence of natural barriers
- Intended & unintended end use of the commodity
- Vectors
- Natural enemies
- Existing production / harvesting practices
- Other specific to pest under consideration

Why may spread be checked

- Listing of non-conducive factors
 - Low prevalence of alternate host
 - Extremes of weather provide natural checks
 - Current farming practices sufficient
 - Vector of low prevalence or spatially/temporally isolated from pest
 - Abundance of natural enemies
 - Topography of land
 - Other specific to pest under consideration

How to assess spread

- Comparative analysis
 - Qualitative (rapid, localised etc)
- Predictive Models
 - Semi-quantitative or quantitative
- Useful information sources
 - Case histories of comparable pests
 - Assessments and information from areas where the pest is present
 - Life history information
 - Site information
 - Expert opinion

Modelling spread

- Model Types
 - Spatial and temporal models
 - Quantitative or qualitative models
- Selecting a model
 - Fit for purpose
 - Scale & time are important
- Challenges
 - Complexity of parameters, especially human behaviour
 - Subjectivity in selection of parameters
 - Lack of, or contradictory, data
 - Difficult to validate

Case Study: Plum Pox Virus

- Background
 - Aphid-transmitted potyvirus
 - Hosts: peaches, plums, apricots
- PRA Area
 - All of Canada
 - Intensive fruit production areas in distinct regions in western, central and eastern Canada
- Pathways
 - Nursery stock, budwood - certain
 - Infested fruit - uncertain
 - Aphids



Factors Influencing Spread Potential

- **Natural factors favouring spread:**
 - Many small orchards in close proximity to each other
 - Urban development adjacent (ornamental host trees)
 - Natural areas along north ridge with many hosts species
 - Several suitable aphid vectors present
 - Aphids fly short distances, skipping trees to feed
- **Natural factors against spread:**
 - Fruit-growing regions geographically distant
 - Western growing region very dry; aphids low or absent
 - Central growing region extremely hot summers; aphids low or absent

Factors Influencing Spread Potential

- **Human factors favouring spread:**
 - Trees propagated vegetatively
 - Individual growers hold lands distributed throughout region
 - Fruit trees and nursery trees destined for domestic use are not virus-tested
 - Symptoms are cryptic; growers are not generally aware
 - Aphid control not generally considered necessary
 - Mixture of fruit tree & ornamental hosts produced commercially in central region

- **Human factors against spread:**
 - Most propagation conducted locally
 - Little or no movement of plant material between regions

Extrapolating from other situations to predict spread

- What is the history of spread of PPV in Europe?
- How does the situation in North America differ from that of Europe?
- How will these differences influence PPV spread?
- Use of hard data, observation & expert opinion



Any questions!

- If you have any questions please feel free to contact:
 - julian.smith@fera.co.uk
 - chris.malumphy@fera.co.uk