

Phase 1 UK Plant Health Risk Register – Summary Guide

Purpose

The UK Plant Health Risk Register records and rates risks to UK crops, trees, gardens and ecosystems from plant pests and pathogens. It forms an agreed, evidence based framework for decisions on priorities for actions by government and plant health stakeholders, including:

- Regulation
- Deregulation or amended regulation
- Industry management of risks
- Targeted surveys
- Pest risk analysis (PRA)
- Contingency planning
- Publicity
- Research

Background

Production of a prioritised register of risks was one of the key recommendations of the independent Task Force on Tree Health and Plant Biosecurity, established at the request of Defra's Secretary of State after findings of Chalara ash dieback in the UK in 2012. The report of the Task Force is available at <https://www.gov.uk/government/publications/tree-health-and-plant-biosecurity-expert-taskforce-final-report>. The Government accepted this recommendation, and work began on the risk register in April 2013.

A series of intensive workshops with stakeholders in spring 2013 gathered views on content and format, and tested out ways of populating the register with a number of key pests. In summer 2013 a core team from Fera and Defra continued the work to complete some 650 entries. Ratings made during the stakeholder workshops were recalibrated by the core team for consistency, but relative positions and resulting actions were retained. The Risk Register was launched at a stakeholder summit in January 2014.

Selection of pests to include

Pests added so far in phase 1 include mainly those listed in the EU Plant Health Directive or by the European and Mediterranean Plant Protection Organisation (EPPO), and those for which a UK Pest Risk Analysis is available, usually because of a past outbreak or repeated interceptions. We have included an entry for “unknown pest” as a reminder that new, previously unknown, risks are continually arising, mitigated to some extent by generic measures applied to pathways such as imported plants for planting, soil and wooden packaging material. We are conscious that a number of important pests have not been picked up during the initial trawl, including some which have been highlighted elsewhere (e.g. the oak pinhole borer is not currently covered). The aim is to correct such omissions as part of the process of developing and using the risk register. Suggestions and supporting evidence on new pests to include are welcome. The intention is to include particularly those threats where there is some prospect of a co-ordinated response by Government and/or stakeholders. It is not the intention, for example, to cover endemic pests being managed on an individual basis by growers or where no action is being taken.

Next steps

Phase 1 has been completed rapidly to spot gaps in our risk mitigations to be filled during 2013/14. The ratings have been assigned by expert judgement, in some cases on the basis of very limited available evidence. We would now welcome additional comments and evidence from stakeholders and interested experts, in parallel to the ongoing work being carried out by Government experts, in order to be able to refine the phase 1 risk register. In particular we would be interested in any relative ratings which do not accord with the judgement of other experts, and will revisit these in the light of any additional evidence provided.

Structure of the Risk Register

There are five main parts to the risk register:

- Key features of the pest
- Unmitigated risk ratings
- Current mitigations
- Mitigated risk ratings
- Actions to reduce the residual risk.

The nature of the risk is specified in the section “Scenario for Risk Register”. For pests which are not normally present in the UK this is the risk of introduction and establishment. For pests which are already established it may be the risk that the pest spreads to the maximum possible extent or, for example, the risk that the pest spreads onto propagating material so that assured healthy plants are no longer available to growers.

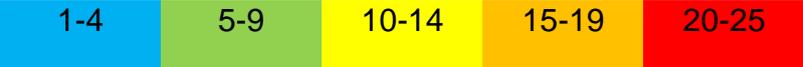
The risk ratings (unmitigated and mitigated) show:

- Likelihood: the likelihood of the risk arising, on a 1-5 scale
- Impact: the impact on the host plants, if it does arise, on a 1-5 scale
- Likelihood x Impact: this provides an indication of the threat to the sector, on a 1-25 scale.
- Value: the value of the host plants in the UK, on a 1-5 scale
- Overall UK risk rating: likelihood x impact x value, on a 1-125 scale

The individual ratings are colour coded as:



The Likelihood x Impact risk rating is colour coded as:



The overall UK risk rating is colour coded as:



In theory these factors could be quantified, so that:

$$\text{Cost of risk in } \text{£ p.a.} = \text{likelihood (probability)} \times \text{impact (\%)} \times \text{value (£ p.a.)}$$

In practice, that degree of quantification is not possible, so ratings are assigned to each factor on a scale of 1 – 5, by expert judgement following more detailed guidance and methodology.

Each risk is rated twice for likelihood and impact: first without mitigations and then with mitigations. Mitigations in this context means co-ordinated action by government, industry bodies or stakeholders to lessen the likelihood or impact of a risk on the risk register. Unmitigated risk ratings are an indication of the risk without any co-ordinated action. Measures by growers to protect their own crops do not count as mitigations. So, for example, insecticide treatments which would be applied by a grower to reduce damage by pests to their crops would not be counted as mitigation. An industry scheme designed to reduce over-wintering and keep populations down for everyone's benefit would count as a mitigation.

Key mitigations are shown where they have an effect on the overall risk rating. Many other risks are mitigated by industry practices and by generic measures taken by the plant health services, but these have not all been included on the register at this stage.

Mitigations can reduce likelihood, impact or both. The difference between unmitigated and mitigated risk represents an expert judgement on the effectiveness of the current mitigations. No assessment has been made in phase 1 of the effect of proposed actions on further mitigating the risk. Therefore, the difference between unmitigated and mitigated risks does not analyse explicitly how future funds could best be deployed, but instead the difference analyses how current interventions help to mitigate risks.

Factors which can be taken into account include:

- Level of compliance with EU/UK import requirements by exporting countries
- Likelihood of pest detection at import and records of interceptions
- Likelihood of pest detection during surveys and records of findings
- Track record of industry sector with accreditation or other forms of assurance
- Likely efficacy of eradication and containment measures for outbreaks
- Records of reporting this pest (or similar) by growers, stakeholders and public
- Track record of research at delivering mitigations for similar pest risks

In cases where the residual risk associated with pests remains relatively high following mitigation, this may be because current mitigations are inadequate and need to be reviewed, or because there is little that can be done practically in terms of additional mitigations to prevent further spread and establishment of the pest. Decisions on priorities for additional action will be informed by the risk register.

It is important not to confuse "priorities for additional action" with "priority pests". If a pest has a low rating, post-mitigation, this does not necessarily mean it is an unimportant pest. Some potentially very damaging pests (e.g. ring rot and brown rot) currently have relatively low ratings based on the high level of regulation and control, but occasional outbreaks do occur and would be very damaging if they were not controlled quickly and effectively. The ratings should not be taken to downgrade the importance of retaining vigilance against such important pests.

The Risk Register and Pest Risk Analysis (PRA)

An entry in the risk register does not replace the need for a pest risk analysis (PRA), carried out, in accordance with international standards, to justify phytosanitary measures. Where a PRA is available, its ratings are taken into account when completing the corresponding entry in the risk register. Where ratings in the PRA differ from those in the risk register this may be because different methodology has been used, a risk area other than the UK was considered in the PRA (e.g. the whole of Europe), or because the risk register is more up to date than the PRA.

Likelihood

The likelihood of entry and establishment of a pest are assessed as part of the PRA process through a well-developed methodology. Entry and establishment are necessary for a pest to be introduced to a new area (such as the UK). For the risk register, the risk of introduction is taken to be the lower of the ratings for entry and establishment, because both steps are needed in sequence, and introduction is limited by the least likely of the two steps.

Factors taken into account in rating risk of entry include:

- Geographic distribution of the pest
- Host range of the pest
- Likelihood of association of pest with pathway at source
- Volume (weight) of trade in host material from origins where the pest occurs
- Likelihood of pest survival along the pathway
- Efficacy of normal supply practices in reducing likelihood of pest entry
- Interception records from UK and other importing countries in Europe
- Whether found on plants for planting, or plant produce
- The chance of the pest moving from the commodity to a host plant
- Possibility of natural spread to UK (i.e. without entry on a trade pathway)

Factors taken into account in rating risk of establishment include:

- Host plant distribution in the UK
- Suitability of UK climate for establishment
- Pest's ability to survive in protected cultivation
- Pest's ability to survive routine crop protection practice

Some pests on the risk register are already present in the UK. In that case the risk may be stated as the risk of the pest spreading to its full potential, taking into account climate and host distribution. Potential spread is also assessed as part of the PRA process. Factors taken into account include the potential for:

- Natural spread within the UK
- Spread by trade pathways within the UK
- Spread by a vector which is present or which is likely to arrive in the UK

If the risk is something other than introduction or spread (e.g. loss of a key control measure) then the likelihood is assessed by expert judgement.

Impact

Impact is an indication of the consequence for a host plant or sector, should the risk materialise. It does not take account of the size or value of the sector, which is rated

separately. Economic, social and environmental impacts have been assessed separately, and then the largest of these impacts has been taken as the overall impact and used to calculate the UK risk rating.

In the case of introduction of a pest, impact reflects the proportion of value of a host crop, sector or ecosystem likely to be lost through the pest presence.

The degree to which economic impacts occur depends firstly on whether and to what extent the pest population exceeds the economic injury level and secondly on whether the pest presence has an impact on trade because of restrictions imposed by export markets. Economic injury depends on the expected population density (based on pest biology and ecology), the amount of damage caused by each individual to the crop, and the relationship between the damage caused and economic loss. Thus, for example, high densities of leaf miners may be needed to cause significant yield loss but much lower densities are likely to produce significant loss in quality of a leafy vegetable crop. If the species is also a virus vector, then the presence of one individual may be sufficient to cause economic damage.

A methodology has been developed for assessing impact on sector based on five factors:

- Impacts in regions of the world where the pest currently occurs
- The expected pest growth and spread on major hosts in the UK
- Relationship between pest growth and spread and economic damage
- Vulnerability of the host to damage
- The number of major hosts affected
- Impact on export markets and balance of trade

Although the relationship between the pest and damage is easier to describe for economic impacts, the same principles are relevant to environmental and social impacts. Environmental impacts are assessed based on the proportion of the environmental value of the plant which is likely to be lost through the introduction of the pest. Some social impacts (e.g. the health impacts of Oak processionary moth) may relate to the presence of the pest directly, rather than its effect on the host plant.

Where the pest is already present and the risk is of spread to full potential rather than introduction, the impact is the impact of that spread, against the baseline of damage already occurring. Thus for a pest which is already widespread, the additional impact of it spreading to its full potential distribution may be limited, even if the pest itself is very damaging or expensive to control. In some cases more clarity may be achieved by separating out different geographic areas for different entries (e.g. Northern Ireland, for pests which are not present there but which are widespread in GB). Phase 2 will include more work on geographic differentiation of risks.

Where the risk is of, for example, loss of an effective control, impact rating is based on expert judgement of the impact should that risk materialise.

Value at risk

Value at risk has been calculated from publically available data for the value of different sectors. This data is of variable quality, with less information available for smaller sectors. Values are calculated for a five year period, to even out annual

fluctuations in yield and price. Values are then converted via a log scale into a rating: 5 for sectors worth > £1bn p.a., down to 1 for sectors worth < £1m p.a.

Value of trees has been based on a total capital value of £50bn divided pro rata by the area of different tree species. Use of capital values for trees reflects the lifetime value of trees at risk from pests and the long timescale for replacement or adaptation. An estimate has been made for social values such as the amenity value of street trees, for which there is some published work. This aspect will be developed further in phase 2.

Values at risk are assumed to be the same unmitigated and mitigated. The only circumstance in which this might not be the case is if mitigation consists of stopping growing a particular crop.

Limitations and work for Phase 2

There are several important limitations in the phase 1 risk register. Work in phase 2 will address:

- More quantification of “likelihood”, “impact” and “value”
- Timescales over which spread and impact may occur
- Costs, effectiveness and acceptability of actions to manage risk
- Differentiation of values and risks in different parts of the UK
- Estimation and representation of uncertainty.

Other limitations are inherent in the nature of such a risk register:

- Lack of cost effective mitigations for some risks
- Uncertainties and gaps in the underlying data
- Difficulties of gathering data on unknown risks

There are also areas of the risk register which are currently under development:

- Pathways
- Receptor systems
- Availability of control options

Pathways

Key pathways have been recorded for each pest on the register. There are a number of major pathways on which plant pests are introduced to Europe and to the UK. Additional or improved measures could provide better mitigation for both known and unknown plant health risks. For example packing of imported plant produce near to related plants can create a high risk of transfer of new pests onto UK crops, unless disposal of waste is carefully managed. Many improvements are already under way internationally (e.g. the international phytosanitary standard on wooden packing material), or at European level (e.g. the EPPO decision support system on plants for planting, and the EFSA study on soil as a pathway).

This section of the risk register will be developed to identify further gaps which need to be addressed by the UK plant health services, and industry.

Crops and receptor systems

Work on the risk register has highlighted inherent vulnerabilities. For example some UK crops are mostly of one variety, or of a limited range of varieties. There are mitigations already in place for this risk, such as the UK Cereal Pathogen Virulence Survey, which is jointly funded by Government and industry, and disease resistance testing of new cereal varieties. Tropical glasshouses open to the public are vulnerable to a wide range of pests which do not otherwise pose risks under UK conditions, but have very limited control options.

This section of the register will be developed further in later iterations.

Availability of control options

There is concern among growers over the reduced availability of control options for commonly occurring plant pests and pathogens. One risk has been included in the register related to possible reduced availability of control options for potato blight (*Phytophthora infestans*). This has been included as an example of how such an entry might appear on the risk register. Defra are in discussion with Chemicals Regulation Directorate as to whether this could be a helpful way to monitor such risks, or whether a separate system would be more appropriate.

Common Name	Latin (Scientific) Name	Family
Apple	<i>Malus</i>	Rosaceae
Ash	<i>Fraxinus</i>	Oleaceae
Asparagus	<i>Asparagus officinalis</i>	Asparagaceae
Barley	<i>Hordeum vulgare</i>	Poaceae
Beech	<i>Fagus</i>	Fagaceae
Beet	<i>Beta vulgaris</i>	Amaranthaceae
Birch	<i>Betula</i>	Betulaceae
Blackcurrants	<i>Ribes</i>	Grossulariaceae
Broad beans	<i>Vicia faba</i>	Fabaceae
Broccoli, Cauliflower, Sprouts and Cabbage	<i>Brassica oleracea</i>	Brassicaceae
Carnations	<i>Dianthus</i>	Caryophyllaceae
Carrots	<i>Daucus carota</i>	Apiaceae
Celery	<i>Apium graveolens</i>	Apiaceae
Cucumber	<i>Cucumis sativus</i>	Cucurbitaceae
Daffodils	<i>Narcissus</i>	Amaryllidaceae
Douglas fir	<i>Pseudotsuga menziesii</i>	Pinaceae
Elm	<i>Ulmus</i>	Ulmaceae
Fir	<i>Abies</i>	Pinaceae
Geraniums	<i>Pelargonium</i>	Geraniaceae
Hops	<i>Humulus lupulus</i>	Cannabaceae
Larch	<i>Larix</i>	Pinaceae
Lettuce	<i>Lactuca sativa</i>	Asteraceae
Oak	<i>Quercus</i>	Fagaceae
Oats	<i>Avena sativa</i>	Poaceae

Oilseed rape, Swedes and Turnips	<i>Brassica napus</i>	Brassicaceae
Onions and Leeks	<i>Allium</i>	Amaryllidaceae
Pansies and Violets	<i>Viola</i>	Violaceae
Parsnips	<i>Pastinaca sativa</i>	Apiaceae
Pear	<i>Pyrus</i>	Rosaceae
Peas	<i>Pisum sativum</i>	Fabaceae
Peppers	<i>Capsicum annuum</i>	Solanaceae
Pine	<i>Pinus</i>	Pinaceae
Poinsettia	<i>Euphorbia pulcherrima</i>	Euphorbiaceae
Poplar	<i>Populus</i>	Salicaceae
Potato	<i>Solanum tuberosum</i>	Solanaceae
Raspberries	<i>Rubus idaeus</i>	Rosaceae
Rhubarb	<i>Rheum rhabarbarum</i>	Polygonaceae
Roses	<i>Rosa</i>	Rosaceae
Runner and Green Beans	<i>Phaseolus</i>	Fabaceae
Rye	<i>Secale cereale</i>	Poaceae
Spruce	<i>Picea</i>	Pinaceae
Stone fruits	<i>Prunus</i>	Rosaceae
Strawberry	<i>Fragaria</i>	Rosaceae
Sweet Chestnut	<i>Castanea sativa</i>	Fagaceae
Sycamore and Maples	<i>Acer</i>	Sapindaceae
Tomato	<i>Solanum lycopersicum</i>	Solanaceae
Watercress	<i>Nasturtium officinale</i>	
Wheat	<i>Triticum</i>	Poaceae

Table 1: This table lists the common name of crops and trees grown in the UK along with their Latin or Scientific name. In order to search for pests specifically on a certain host, enter the Latin name into the Risk Register search bar. Some pests have many hosts (polyphagous) and in this case the taxonomic plant family attacked is in the host list rather than the individual species. To look for highly polyphagous pests that may attack a certain host, please search by family.

Note: The taxonomic names provided are those that are used in the Risk Register, but different scientific names may be used by other authorities.