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European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

PM 5/6 (1)

Guidelines on Pest Risk Analysis
Lignes directrices pour l'analyse du risque phytosanitaire

EPPO prioritization process for invasive alien plants

Specific scope

This Standard describes a process for the prioritization of alien plants to produce risk-based lists of invasive alien plants and also to determine those plants that require a pest risk analysis.

Specific approval

First approved in 2012-09.

Introduction

The standardization of invasiveness assessment is a major prerequisite for developing early warning and information systems across EPPO countries. The results of a recent survey (Genovesi *et al.*, 2010) show that international coordination is still lacking and that common data, protocols and standards are still needed. The EPPO prioritization process is intended as a simple and flexible tool to provide consistent lists of invasive alien plant species for EPPO countries or to reprioritize existing lists of invasive alien plants, and to allow constructive discussions on, and comparisons of, invasive alien plants. It also enhances the exchange of data on invasive alien plants between EPPO countries, and helps priorities to be identified for prevention and rapid eradication measures. Its use can reduce the variability between invasiveness assessments when done in the framework of a group composed of different experts (Branquart *et al.*, 2010a). It is also important to provide straightforward, transparent criteria that can be presented to relevant stakeholders, such as land managers, the horticultural industry and the general public, in order to justify and explain actions to be undertaken on invasive alien plants. The process can be used for any plant at any regional, biogeographical, national or local level.

The prioritization process has two particularities.

Firstly, it considers both the spread potential of a species and its potential negative impacts to reach a conclusion on its invasive behaviour. Three types of potential negative impact are considered in the process: impacts on native species, habitats and ecosystems; impacts on agriculture, horticulture or forestry; and additional impacts (e.g. on animal and human health, infrastructures, recreational activities). It is to be noted that both environmental and agricultural impacts are considered, the prioritization process being intended to create dialogue between these two sectors.

Secondly, the prioritization process proposes as a proxy to environmental impacts the ability of an alien plant to form dense, persistent populations in habitats that are valuable for nature conservation.

This Standard describes the criteria used in the EPPO prioritization process for invasive alien plants.

Terms used in this document follow ISPM no. 5 *Glossary of phytosanitary terms* (IPPC, 2010).

Objectives

This process is designed (i) to produce a list of invasive alien plants that are established or could potentially establish in the area under assessment; and (ii) to determine which of these have the highest priority for a Pest Risk Analysis (PRA).

This process does not in itself prioritize those invasive alien plants for which actions to prevent or regulate import/sale/holding are warranted, or for which eradication/containment/suppression measures are likely to be cost-effective. To identify and justify the most appropriate actions, a PRA is still required. EPPO Standard PM 5/3 (EPPO, 2011) describes the PRA process.

The highest priority for performing PRA is given to species that satisfy the following criteria:

- they are spreading rapidly (or are known to have a capacity to spread rapidly);
- they are capable of causing major economic and environmental impacts;

- they are moved from country to country primarily by human activities;
- they still have a significant area suitable for further spread.

It should be kept in mind that the process is designed to perform rapid assessments, and to provide structured and traceable information on species. It does not in any way provide a substitute for a PRA.

Methods

The process can be used for any plant at any regional, biogeographical, national or local level.

The process consists of compiling available information on alien plants according to predetermined criteria. To consider whether a species already present in the EPPO region qualifies as an invasive alien plant, the criteria used rely primarily on observations and invasion histories in the area under assessment and in the EPPO region.

The process produces lists of plant species for the area under assessment, the most important being the list of invasive alien plants and the list of priority species for performing a PRA. The process is summarized in Fig. 1.

Available sources of information to run the process include: NPPO data, scientific literature, personal communications from scientists and botanists, websites and databases on invasive alien plants. Existing PRAs also need to be consulted (e.g. on the EPPO and NPPO websites). Information needs to be updated on a regular basis. All references and contacts need to be provided to allow traceability (see Appendix 1 for a non-exhaustive list of information databases on invasive alien plants).

Whenever possible, evidence should be obtained from previously observed invasive behaviour in the EPPO region. Information on invasive behaviour elsewhere in the world may also provide guidance. When contradictory information is found within the EPPO region, the worst case should be considered. As much information as possible should be included when documenting each species, and references should be provided, indicating where the documented impacts have been observed, in order to be able to differentiate between impacts that actually occurred in the area under assessment and potential impacts. When describing the process in this document, for each question examples are provided for a given biogeographical area or country. It is acknowledged that other examples may exist and may be added in a later version of the EPPO prioritization process. Communication between experts may be organized to increase the quality of the outcome of this process. For questions that need a rating, a three-point scale (low, medium, high) is used as in Branquart (2007).

Uncertainty should be recorded for questions on spread and impact, and should be summarized in an overall uncertainty rating of low, medium or high. The elements of uncertainty should be described. The assessor may consider an assessment as particularly uncertain for the following reasons.

- The species is absent from the area under assessment or of limited distribution, and the impacts are recorded for another country, or even for a different continent. This is the case for *Alternanthera philoxeroides*, which has been recorded only recently in France and Italy, but is considered a very invasive plant where it has been introduced elsewhere (Australia, China, India, North America, New Zealand, etc.).
- The species, although being present in the area under assessment, exhibits different behaviour in different places, or there is conflicting information available. This is the case for *Cabomba caroliniana*, which is invasive in Netherlands, but not currently exhibiting invasive behavior in Belgium, Hungary or the United Kingdom.
- There is little or no data available, as is the case for *Amelanchier spicata* in the EPPO region.

Uncertainty therefore depends on the presence or absence of the plant in the EPPO region; the availability of data on its behaviour; and possible conflicting information. A matrix indicating uncertainty ratings is given in Table 1.

Outcomes

The first step of the process produces different lists of invasive alien plants for the area under assessment.

- List of invasive alien plants:

  This list contains species that have already shown highly invasive behaviour in the area under assessment. It also contains species that are not yet established in the area under assessment, have proven to be highly invasive outside this area, and are considered to represent a high risk. When considering the establishment of the species, the biogeographical regions of Europe developed by the European Environmental Agency (see Appendix 2) may be of primary relevance.

  The plants in this list will be submitted to the second step of the process to establish priorities between species for which a PRA is needed.
- Observation list of invasive alien plants.

  This observation list of invasive alien plants contains species that are present in the area under assessment and for which more information is needed to determine their invasive behaviour. It also contains species that are absent from the area under assessment and for which more information is needed.

  The species placed in the observation lists are of concern if shifts in invasive behaviour occur, or if knowledge improves. It is stressed that inclusion in the observation list of invasive alien plants is not definitive, and changes can be made when additional information is recorded, particularly when information on invasiveness becomes available. The observation list of invasive alien plants therefore contains both species that represent a medium risk, and species for which not enough information is available to make an accurate assessment.

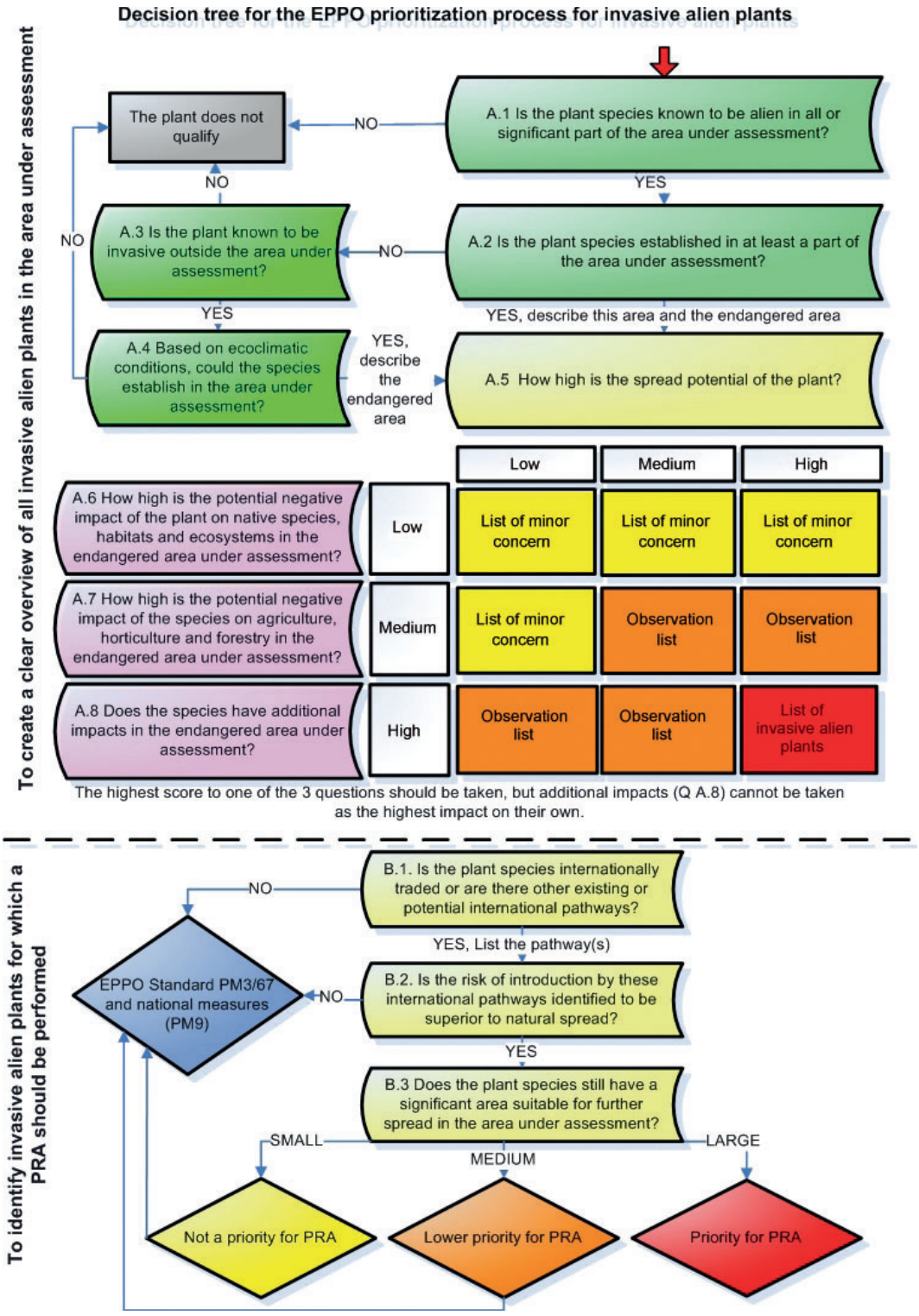

Fig. 1 Decision tree summarizing the EPPO prioritization process for invasive alien plants.

Further development may allow the different sources of uncertainty to be taken into account in the prioritization process.

Species on the observation list of invasive alien plants are not submitted to the second step of the process to establish priorities between species for which a PRA is needed.

Table 1 Matrix indicating possible uncertainty ratings

	Plant absent from area under assessment	Plant present in area under assessment, but newcomer	Plant widely present in area under assessment
Initial uncertainty	Medium or high uncertainty	Low or medium uncertainty	Low uncertainty
+ Lack of data	High uncertainty	Medium or high uncertainty	Medium or high uncertainty
+ Conflicting data on behaviour	High uncertainty	Medium or high uncertainty	Medium or high uncertainty

Other assessed species that do not fall into the previously described lists are placed on the list of minor concern. They are listed as such and the assessments are stored.

The second step of the process will consider the species on the list of invasive alien plants to prioritize the species for which a PRA is needed. Two outcomes are possible.

- International action might prevent introduction and spread of the species: a PRA should be performed as a priority aiming to produce international recommendations. A PRA should be performed by following EPPO Standard PM 5/3 *Decision-support scheme for quarantine pests*.

EPPO Standard PM 3/67 *Guidelines for the management of invasive alien plants or potential invasive alien plants which are intended for import or have been intentionally imported* may be used to identify international actions. The larger the area for further spread of the species, the higher the priority for PRA.

- International action is not recommended. A PRA is not considered a priority, but national action could be recommended, see EPPO Standard PM 3/67 *Guidelines for the management of invasive alien plants or potential invasive alien plants which are intended for import or have been intentionally imported*.

See a summary of the lists and steps in Fig. 1.

A. Prioritization process scheme for the elaboration of different lists of invasive alien plants (pests or potential pests) for the area under assessment

See Fig. 1 for the summary of this process in the form of a decision tree.

A.1 Is the plant species known to be alien in all, or a significant part, of the area under assessment?

As an example, when considering the EPPO region, Tutin *et al.* (1964/80) (*Flora Europeae*) is taken as the reference to state whether or not a plant species is indigenous in the Western and Central EPPO region. Other references may be used for other areas: Maire (1952–1987) for North Africa, Davis (1965–1985) for Turkey, etc.

In the case of the EPPO region, the area under assessment is huge and comprises different biogeographical areas. For instance, whereas *Heracleum mantegazzianum* is native to the Caucasus (EPPO region), it is alien in Western European countries. The answer to this question for *H. mantegazzianum* would therefore be 'yes' as it is alien in a significant part of the EPPO region.

For the purpose of the process of prioritization, the answer to this question should also be 'yes' for species that are not present in the EPPO region.

- **If yes: go to A.2.**
- **If no:** the plant does not qualify as an alien plant for the area under assessment.

A.2 Is the plant species established in at least a part of the area under assessment?

- If yes: describe the area where the species is established, and the area of potential establishment, considering major factors such as climatic conditions and soil conditions. World hardiness zones map (Magarey *et al.*, 2008), world Köppen–Geiger climate classification map (Kottek *et al.*, 2006) and the map of the biogeographical regions of Europe (European Environmental Agency, 2001) can be used to compare the areas where the species is recorded and the area under assessment (see maps in Figs A1–A3 in Appendix 2).

  Go to the assessment of spread and impacts (QA.5–A.8).
- If no: the plant has never been observed in the wild in the area under assessment, or is recorded only as transient and may be in the process of establishment. **Go to A.3.**

Invasive behaviour outside the area under assessment

A.3 Is the plant species known to be invasive outside the area under assessment?

As the species is not established in the area under assessment, it is only possible to assess its behaviour elsewhere (potential to spread easily in the environment and to affect native biodiversity and/or managed ecosystems). The fact that the species is reported as invasive elsewhere, at least in regions having similar ecological and climatic conditions, is considered one of the most relevant criteria in predicting the invasive behaviour of a species (Williamson, 1996).

Note that transient species may still have seasonal adverse impacts, such as *Eichhornia crassipes* and *Pistia stratiotes* in Netherlands (Bruinsma, 2000).

- **If yes: go to A.4.**
- **If no:** the plant does not qualify as an invasive alien plant for the area under assessment and is placed on the list of minor concern.

Assessment of establishment

A.4 Based on ecoclimatic conditions, could the species establish in the area under assessment?

Aquatic plants are less susceptible to climate than terrestrial plants, and this element should be taken into account when answering this question.

World hardiness zones map (Magarey *et al.*, 2008), world Köppen–Geiger climate classification map (Kottek *et al.*, 2006) and the map of the biogeographical regions of Europe (European Environmental Agency, 2001) can be used to compare the areas where the species is recorded and the area under assessment (see maps: Figs A1–A3 in Appendix 2).

For instance, the tropical plant *Psidium cattleianum* (Myrtaceae) is unlikely to establish in almost all parts of the EPPO region.

- **If yes: describe the area of potential establishment considering major factors such as climatic and soil conditions, go to assessment of spread and impacts (Questions A.5–A.8).**
- **If no:** explain why the species could not establish, the plant does not qualify as an invasive alien plant for the area under assessment and is placed on the list of minor concern.

Assessment of spread and impacts

Questions A.5, A.6, A.7 and A.8 all have to be assessed independently. The risk should be considered for the area under assessment where the species is able to establish and to cause damage. The risk should not be downgraded by making an average for the entire area under assessment, if it is different from the area of potential establishment.

As far as possible, evidence should be obtained from records of invasive behaviour in the area under assessment or in the EPPO region. Information on invasive behaviour elsewhere may also provide guidance.

It should be ensured that suitable habitats are present in the area under assessment, for instance, mangroves and some specific cropping systems are not found in the EPPO region.

Any impact through hybridization on native plant species, crops or wild crop relatives is also considered in this section.

A.5 How high is the spread potential of the plant in the area under assessment?

This section addresses the potential of an organism to spread to unintended habitats by natural means (water, birds, wind, etc.) or by unintentional human assistance (movement of soil, discarded aquarium plants, etc.) via seeds, plant fragments or any other propagules able to regenerate a plant. Intentional introduction by man is not taken into consideration in order to focus on the intrinsic spread capacity of the species. The potential effects of climate change may also be taken into account while considering this question.

- **Low:** the plant does not spread because of poor dispersal capacity (e.g. gravity dispersal) and a low reproduction potential. Propagules are rarely found over distances exceeding a few metres from the mother plant. For example, *Aloe vera* and *Agave americana* reproduce vegetatively only at a slow rate and rarely produce seeds. Go to the assessment of impacts.
- **Medium:** the plant reproduces vigorously vegetatively and/or sexually and spreads mainly in the vicinity of the mother plant; dispersion capacity in the environment rarely exceeds 100–200 m from the mother plant. For example, *Quercus rubra* reproduces by seeds and stem sprouts, which are dispersed around the mother plant. Examples of medium spread include species dispersed by wind but with heavy diaspores, or spread by ants. Unintentional dispersion by man is infrequent. **Go to the assessment of impacts.**
- **High:** the plant is highly fecund and is regularly observed to spread over distances >500–1000 m from the mother plant, either:
  - by water – especially species invading riparian habitats that have diaspores with high buoyancy. This includes fruits, seeds or fragments of aquatic or riparian herbaceous plants such as *H. mantegazzianum*, *Impatiens glandulifera* and *Ludwigia* spp., but also primarily wind-dispersed ornamental trees such as *Acer negundo*, *Ailanthus altissima* and *Fraxinus pennsylvanica* (Säumel & Kowarik, 2010);
  - by wind – especially species with light seeds and/or seeds with special adaptations to long-distance dispersal such as pappus. For example, *Cortaderia selloana* produces thousands of seeds that are wind-dispersed over long distances;
  - by animals – especially species with edible fruits dispersed by birds and other highly mobile animals. For example, seeds of *Opuntia ficus-indica* and *Prunus serotina* are dispersed by birds feeding on fruits (Deckers *et al.*, 2005; Pairon *et al.*, 2006);
  - spread unintentionally by human activities – by movement of soils, or dispersed by farm machinery or by traffic vehicles. For example, *Ambrosia artemisiifolia* is dispersed along roads by vehicles and by machines used to mow road verges; rhizomes of *Fallopia* spp. are often dispersed with soil movements. **Go to the assessment of impacts.**

Uncertainty rating: low, medium, high.

A.6 How high is the potential negative impact of the plant on native species, habitats and ecosystems in the area under assessment?

List natural and semi-natural habitats where the species in known to occur. It includes all EUNIS habitat types 1

(http://eunis.eea.europa.eu/habitats-code-browser.jsp), except I (Regularly or recently cultivated agricultural, horticultural and domestic habitats) and J (Constructed, industrial and other artificial habitats).

This addresses the potential for a plant to induce long-term population loss affecting rare and threatened species, and to cause serious habitat or ecosystem effects that are difficult to reverse. Ecosystem effects include disruption of natural processes (alteration of food webs, modification of nutrient cycling, alteration of natural successions) and modification of habitat structure (light interception, water cover, alteration of river banks, etc.).

The potential to displace native species by competitive interactions (including allelopathy, competition for pollinators, etc.) and to alter ecosystems is difficult to demonstrate and is rarely documented in the scientific literature, especially at the beginning of the invasive process. As these effects are known to be typically density-dependent (Richardson *et al.*, 1989, 2000; Bímová *et al.*, 2004; Thiele *et al.*, 2010), such impacts can be estimated by considering the species' ability to build large, dense and persistent populations (with cover of at least 80%), as proposed by Brunel & Tison (2005) and Branquart (2007). This is expected to be encountered more often with perennial than with annual plants, especially tall perennials (Hejda *et al.*, 2009).

There are exceptions for alien species hybridizing with native species, which may pose a high risk even at low densities of the alien plant (Daehler & Strong, 1997; Huxel, 1999; Wolf *et al.*, 2001).

Serious effects on biodiversity may occur in habitats of value for nature conservation, where rare or threatened species are likely to occur, and in areas of endemism (e.g. islands). The habitats and ecosystems in which the species may have negative impacts on native species in the potential area of establishment should be listed. See for instance the list of habitats in the Appendix 1 of the Directive 92/43/EEC.

- **Low:** the plant does not form dense, persistent populations and rarely colonizes habitats that have a value for nature conservation. For example, the ornamental plant *Amaranthus caudatus* can escape and colonize villages, cemeteries or river banks without forming dense populations in France (Antonetti *et al.*, 2006); the ornamental *Datura wrightii* can also escape in ruderal areas, roadsides and dumps in Corsica (France) (Jeanmonod & Gamisans, 2007); *Nicandra physaloides* escapes gardens and is sometimes found on roadsides and along river beds in France (Antonetti *et al.*, 2006).
- **Medium:** the plant forms large, dense, persistent populations only in habitats modified by human activities and/or occurs in habitats that have value for nature conservation, but does not form large, dense, persistent populations. For example, *Bidens subalternans* forms dense, monospecific stands along roadsides, in fallow lands and in crops, but is rarely found in semi-natural or natural habitats in France (Fried, 2012); in France and Belgium, *Veronica persica* is abundant only in cultivated fields (Lambinon *et al.*, 2004; Verloove, 2006; Fried, 2010); *Amelanchier lamarckii* is found in some high conservation value habitats without forming dense populations (Muller, 2004; Branquart *et al.*, 2010a,b); *Juncus tenuis tenuis* is also typically found along wet forest roads and edges of gravel ponds (Dupont, 2001; Lambinon *et al.*, 2004; Rivière, 2007) but is usually in low densities when found in valuable and vulnerable natural communities (Bardet *et al.*, 2008; Verloove, 2012).
- **High:** the plant is reported to colonize habitats that have a value for nature conservation where it forms large, dense. persistent populations. For example *Crassula helmsii, Eichhornia crassipes* and *Ludwigia grandiflora* in water bodies in the United Kingdom, Spain and France, respectively (Langdon *et al.*, 2004; Muller, 2004; Ruiz Téllez *et al.*, 2008); *Carpobrotus* spp. in dune ecosystems in the Mediterranean and Atlantic parts of France (Muller, 2004); *Rosa rugosa* in dune ecosystems in the Atlantic and boreal regions (Kollmann *et al.*, 2007; Isermann, 2008). Alien plant species that may easily produce fertile hybrids with native congeneric species may pose a significant risk to the survival of these plant species by assimilation/introgression, even if they do not form dense populations. They therefore should be considered in this category. Examples include *Spartina alterniflora* × *S. foliosa* in San Francisco Bay (Daehler & Strong, 1997); *Hyacinthoides hispanica* × *H. non-scripta* in Scotland (Kohn *et al.*, 2009); *Populus* × *canadensis* threatening *Populus nigra* in Central Europe (Bleeker *et al.*, 2007; Smulders *et al.*, 2008). Species that can significantly alter soil conditions are also considered, for example, nitrogen-fixing species that increase nitrogen soil content in oligotrophic soils such as *Robinia pseudacacia* (Rice *et al.*, 2004), *Acacia* spp. (Marchante *et al.*, 2008) and *Lupinus polyphyllus* (Fremstad, 2006); as well as species modifying soil pH and/or organic content due, for example, to low decomposition rate, such as *Carpobrotus* spp. (Conser & Connor, 2009).

Uncertainty rating: low medium high.

A.7 How high is the potential negative impact of the plant on agriculture, horticulture or forestry in the area under assessment?

The habitats and the situations in which the species has negative impact on agriculture, horticulture or forestry should be listed. It includes EUNIS habitat (http://eunis.eea.europa.eu/habitats-code-browser.jsp) I (Regularly or recently cultivated agricultural, horticultural and domestic habitats) and J (Constructed, industrial and other artificial habitats).

Negative impacts on managed areas such as parks or golf courses should also be considered in this section.

The impact of an alien plant can vary greatly in different countries, and can change rapidly according to the relative importance of crop type where it has negative impacts and according to the available method of control (including the authorized herbicides).

- **Low:** no yield or other economic losses are reported, the species is mainly reported as 'accidental'. The presence of the species is either sporadic and generally only a few individuals are found in the crop; or, when the species is frequent or abundant, it is a weak competitor due, for example, to its small size – *Crepis sancta* invades vineyards in the South of France, forming large populations, but its small size (10–40 cm) and rapid life cycle in early spring do not affect vine production (Marmarot *et al.*, 2002). Other examples of species with low impact in cultivated fields include species with no particular adaptation to regular disturbances (in contrast to therophyte and geophyte species with effective vegetative reproduction, most chamephytes and phanerophytes have a low probability of survival in regularly ploughed fields).
- **Medium:** yield or other economic losses are reported, but occur only in particular conditions (e.g. with inappropriate management practices). For instance, with the currently available herbicides, *Amaranthus* spp., *Galinsoga parviflora* and *Galinsoga quadriradiata* are controlled in maize crops in France (Mamarot & Rodriguez, 2003) and Germany (Schönhammer *et al.*, 2006).
- **High:** the species is frequently reported to cause significant yield reduction or other significant economic losses. The species can be dominant in a crop with regular management and is often very abundant, for example, *Solanum elaeagnifolium* in orchards or potato fields in North Africa (Mekki, 2007) and in Greece (Kotoula-Syka, 2011); *Sorghum halepense* in sorghum, sunflower or maize in Hungary (Pal, 2004) and in cotton in Turkey (Gunes *et al.*, 2008); *Panicum* spp. in maize in Czech Republic (Holec *et al.*, 2002); *Sicyos angulatus* in maize in Spain (Recasens *et al.*, 2007). *Eichhornia crassipes* blocks waterways and irrigation channels in Spain, as well as in many tropical and subtropical countries (Gopal, 1987; Ruiz Téllez *et al.*, 2008). *Prunus serotina* causes forest yield reduction and increases control costs in forestry, and impedes the natural rejuvenation of forest trees in Germany and France (Starfinger *et al.*, 2003; Decocq, 2007). Crop-wild and crop-weed hybridization is also recognized as being very important in generating more noxious weeds (Campbell *et al.*, 2006). For example, the hybridization of wild and cultivated sunflower (*Helianthus annuus*) has formed hybrids in Spain and France that evolved to become locally invasive populations (Muller *et al.*, 2009).

Uncertainty rating: low, medium, high.

A.8 How high are the potential additional impacts (e.g. on animal and human health, on infrastructures, on recreational activities, other trade related impacts such as market losses)?

List the impacts and notify competent authorities. Examples are listed below.

Rhus toxicodendron is established in Netherlands and France, and causes burns when in contact with the skin. *Ambrosia artemisiifolia* has a high impact on human health as its pollen is considered to be highly allergenic (Déchamp & Méon, 2003). Stands of *Ludwigia* spp. can be very dense, with highly branched and very solid stems several metres long, preventing any passage, having large detrimental impacts on tourism and local recreational activities (swimming, boating, fishing, hunting, leisure, etc.) (Dutartre *et al.*, 2007). *Ailanthus altissima* damages roads, infrastructure and archeological sites due to strong and rapid root development (Caneva, 1991). *Ambrosia* spp. have been added to the list of harmful botanical impurities that are included in Directive 2002/32/EC on undesirable substances in animal feed, the presence of *Ambrosia* species contaminating animal feed may, as a consequence, incur market losses in the European Union.

These impacts should be ranked as low, medium or high. As these factors are varied, it is difficult to give examples of ranking. Individual judgement on ranking should be made.

Uncertainty rating: low, medium, high.

Responses to questions on impacts (A.6, A.7 and A.8) should be reported in the matrix in Fig. 2 in order to categorize the species. The highest score should be considered; however, impacts listed in question A.8 cannot be taken on their own as the highest impacts. Only if A.6 and/or A.7 is medium and A.8 is high should the overall impact be considered high.

Those species that have both a high spread potential and a high impact (either on cultivated or uncultivated ecosystems) are included in the list of invasive alien plants. Species with either medium spread or impact are included in the observation list of invasive alien plants. Species with low spread and high impact are also included in the observation list of invasive alien plants. All other species are registered on the list of minor concern.

The conclusions of the process should be presented in a matrix (see Fig. 2).

The overall uncertainty for Part A of the EPPO prioritization process for invasive alien plants should be summarized.

Overall uncertainty rating: low, medium, high.

The species falling into the list of invasive alien plants are those qualifying for section B 'Prioritization process scheme for the identification of invasive alien plants for which a PRA is needed'.

		A5 – Spread potential		
		Low	**Medium**	**High**
Adverse impacts (maximum rating from questions A6, A7. and A.8)	**Low**	List of minor concern	List of minor concern	List of minor concern
	Medium	List of minor concern	Observation list of invasive alien plants	Observation list of invasive alien plants
	High	Observation list of invasive alien plants	Observation list of invasive alien plants	**List of invasive alien plants** **Go to B1.**

Fig. 2 Matrix combining spread potential and adverse impacts.

B. Prioritization process scheme for the identification of invasive alien plants for which a PRA is needed

B.1 Is the plant species internationally traded or are there other existing or potential international pathways?

The species may be imported intentionally for ornamental purposes (as a plant to be planted in the wild, as an aquarium plant, etc.); for agricultural or forestry purposes; for research purposes, etc. The species may be imported unintentionally as a contaminant of consignments (of grain, of seeds, of soil as a growing medium, etc.), or may be a hitchhiker on travelers or machinery, etc.

National pathways that spread the plant only within a given country are not considered in the question (e.g. natural spread over short distances, movement of soil within a country, movement of cattle within a country).

This question may apply and be adapted to different geographical areas under assessment.

- **If yes:** at least one international pathway is identified, **list the pathway(s). Go to B.2.**
- **If no:** only spread pathways are identified, this plant is not a priority for PRA, see EPPO Standard PM 3/67 *Guidelines for the management of invasive alien plants or potential invasive alien plants which are intended for import or have been intentionally imported*. Recommendations for management at national level through National Regulatory Control Systems (PM9) may be developed.

B.2 Is the risk of introduction by these international pathways identified to be superior to natural spread?

As stated in ISPM No. 11 *Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms*, 'Measures are not justified if the risk is already acceptable or must be accepted because it is not manageable (as may be the case with natural spread, e.g. *Senecio inaequidens*)'.

- **If yes: go to B.3.**
- **If no:** this plant is not a priority for PRA, see EPPO Standard PM 3/67 *Guidelines for the management of invasive alien plants or potential invasive alien plants which are intended for import or have been intentionally imported*. Recommendations for management at national scale through National Regulatory Control Systems (PM9) may be developed.

B.3 Does the plant species still have a significant area suitable for further spread in the area under assessment?

Consider the extent to which the species has colonized all suitable habitats in the areas where ecological factors favour its establishment in the area under assessment. This will depend on the area invaded and on the number of distinct populations.

The figures provided below are only indicative.

- **Small area suitable for further spread:** more than 40% of the potential suitable area in the area under assessment is already occupied, for example, *Carpobrotus* spp. and *A. altissima* cover more than 40% of their potential establishment area in the EPPO region. **A PRA is not considered a priority.**
- **Medium area suitable for further spread:** 10–40% of the potential suitable area in the area under assessment is currently occupied, for example, *Cortaderia selloana* covers about 30% in the Atlantic and Mediterranean biogeographical regions. **The species assessed is a lower priority for PRA.** The guidelines on pest risk analysis of EPPO Standard PM 5/3 *Decision-support scheme for quarantine pests* should be followed for the performance of a PRA.
- **Large area suitable for further spread:** less than 10% of the potential suitable area in the area under assessment is currently occupied, e.g. *Althernanthera philoxeroides* is locally distributed in Italy and covers <5%, *Ludwigia grandiflora* and *L. peploides* are still locally distributed and cover <10% in Netherlands. **The species assessed is a high priority for PRA.** The guidelines on pest risk analysis of EPPO Standard PM 5/3 *Decision-support*

scheme for quarantine pests should be followed for the performance of a PRA.

A tool for cooperation

The species can be considered at the level of one or more biogeographical regions to allow comparisons between the countries of the EPPO region, as well as between different biogeographical regions. The acquired experience will enhance implementation of the prioritization process and add further case studies.

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Appendix 1

Existing databases on invasive alien plants

The main existing databases containing information on invasive alien plants at the global or European level are mentioned below. A comprehensive list of databases on invasive alien plants is available on the EPPO CAPRA Network upon free registration (http://capra.eppo.org/).

The CABI *Crop Compendium* (CPC) provides thousands of datasheets on plant pest and plants describing damage, distribution, control and biology/ecology: http://www.cabi.org/compendia/cpc

The CABI *Invasive Species Compendium* (ISC) contains descriptions of over 1500 invasive alien plants with their distribution, impacts, control and biology/ecology: http://www.cabi.org/compendia/cpc

DAISIE (Delivering Alien Invasive Inventories for Europe) was funded by the EU and provides information on the presence of more than 10 000 alien species in Europe. Information is available through an online database of alien species: http://www.europe-aliens.org/index.do

The EPPO Plant Quarantine Data Retrieval System (PQR) contains information on the distribution, as well as impacts, management methods of thousands of quarantine pests, as well as on invasive alien plants: http://www.eppo.org/DATABASES/databases.htm

The Global Invasive Species Information Network (GISIN) was formed to provide a platform for sharing invasive species information at a global level, via the internet and other digital means: http://www.gisinetwork.org

The Global Invasive Species Database (GISD) focuses on invasive alien species that threaten native biodiversity, and covers all taxonomic groups from micro-organisms to animals and plants in all ecosystems: http://www.issg.org/database/welcome

The North European and Baltic Network on Invasive Alien Species (NOBANIS) has developed a network of common databases on alien and invasive alien species of

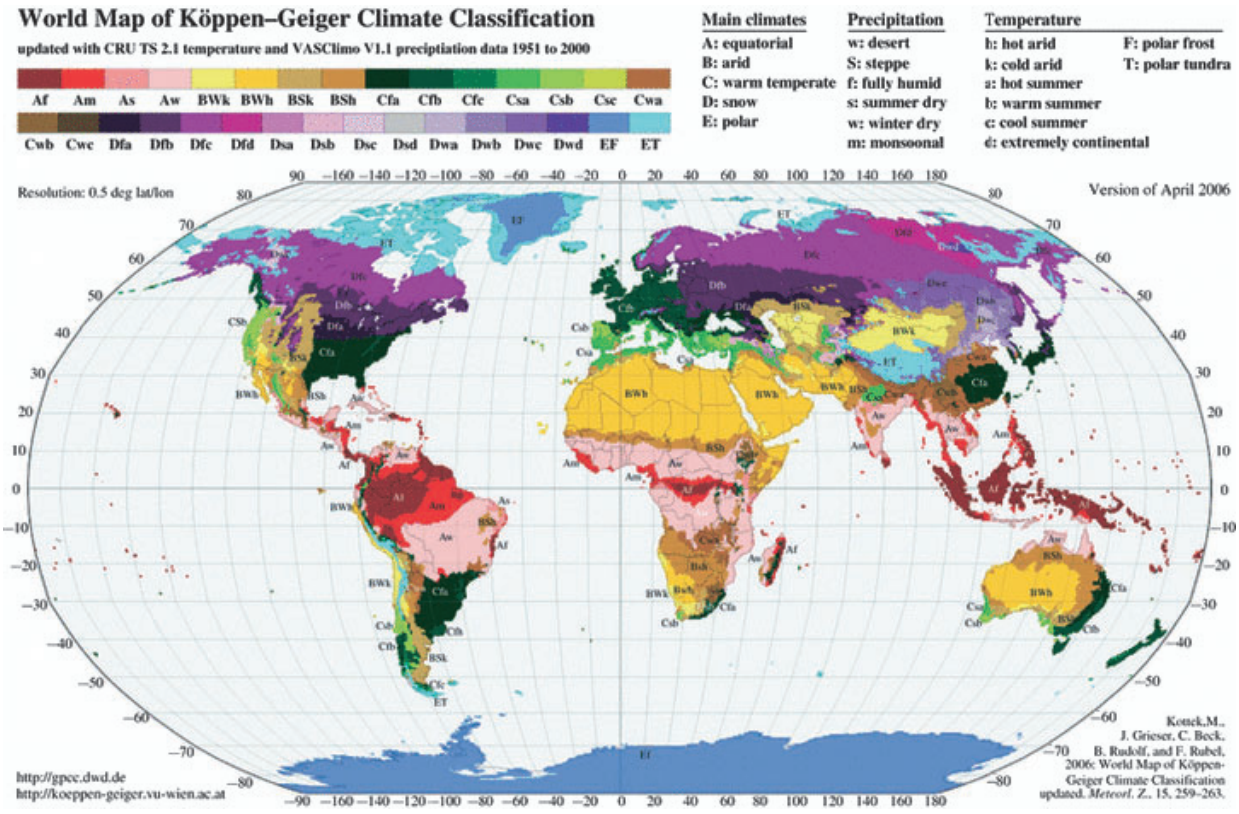

Fig. A1 World map of the Köppen–Geiger climate classification updated with mean monthly CRU TS 2.1 temperature and VASClimO v1.1 precipitation data for the period 1951 to 2000 on a regular 0.5° latitude/longitude grid. Taken from Kottek *et al.* (2006).

the region. The participating countries are Denmark, Estonia, Finland, Faroe Islands, Germany, Greenland, Iceland, Latvia, Lithuania, Norway, Poland, European part of Russia and Sweden: http://www.nobanis.org/About.asp

Appendix 2

Maps for climatic comparisons

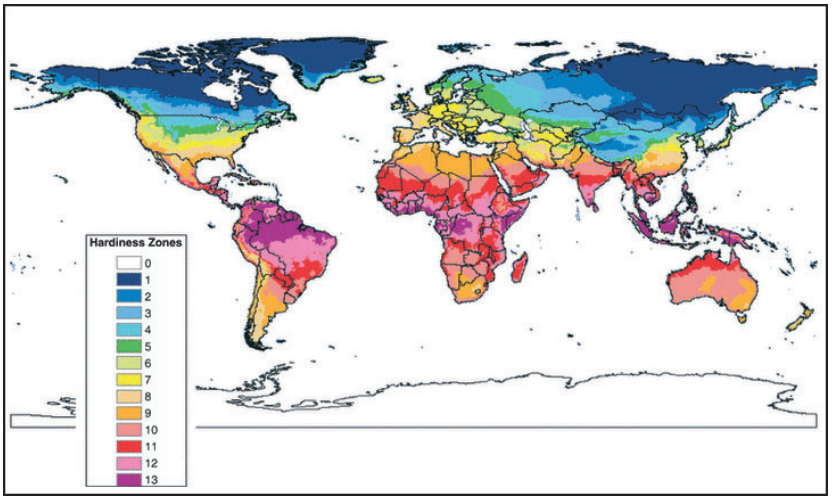

Fig. A2 World Hardiness Zones map. Adapted from Magarey *et al.*, 2008.

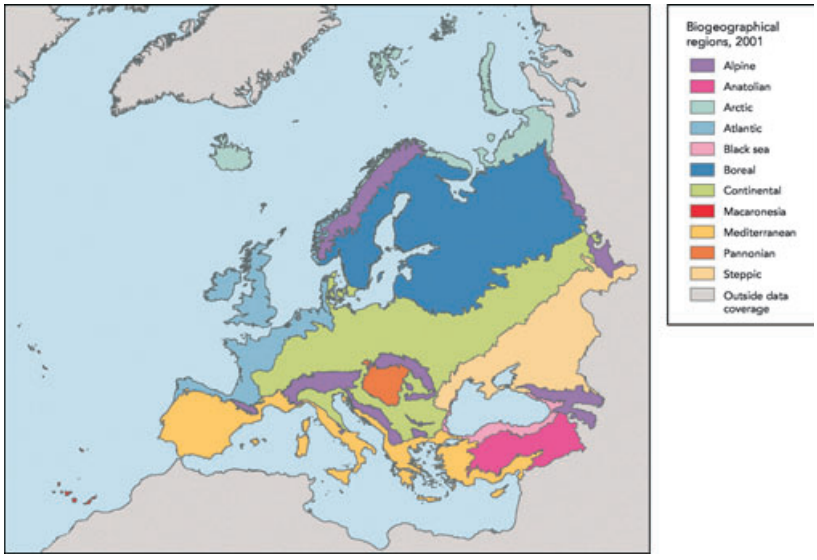

Fig. A3 Biogeographical regions in Europe, 2001, European Environmental Agency. This map is available at: http://www.eea.europa.eu/data-and-maps/figures/biogeographical-regions-europe-2001.