



Appendix A

## Harmonia<sup>+PL</sup> – procedure for negative impact risk assessment for invasive alien species and potentially invasive alien species in Poland

### QUESTIONNAIRE

#### A0 | Context

Questions from this module identify the assessor and the biological, geographical & social context of the assessment.

##### a01. Name(s) of the assessor(s):

first name and family name

1. Anna Gazda
2. Dan Wołkowycki
3. Czesław Hołdyński

acomment01.	Comments:	degree	affiliation	assessment date
	(1)	dr hab. inż.	Department of Forest Biodiversity, Institute of Forest Ecology and Silviculture, Faculty of Forestry, University of Agriculture in Krakow	13-01-2018
	(2)	dr	Faculty of Forestry, Białystok University of Technology	08-05-2018
	(3)	prof. dr hab.	Department of Botany and Nature Protection, Faculty of Biology and Biotechnology, University of Warmia and Mazury in Olsztyn	15-03-2018

##### a02. Name(s) of *the species* under assessment:

Polish name: Jesion pensylwański  
Latin name: ***Fraxinus pennsylvanica*** Marshall  
English name: Green ash

acomm02.

Comments:

The preferred scientific name accepted in the Plant List (2013 – B) is *Fraxinus pennsylvanica* Marshall; Polish synonym: jesion omszony (after Mirek et al. 2002 – P); other English names (apart from those listed): red ash, water ash (Kennedy and Harvey 1990 – P). The species is characterized by high morphological variability, and is described under about 85 synonyms of various rank, as taxa classified into three genera: *Calycomelia*, *Fraxinus* and *Leptalis* (The Plant List 2013 – B); e.g., *Fraxinus lanceolata* Borkh., *F. pubescens* Lam., *F. campestris* Britt., *F. darlingtonii* Britt. Confused with other species, especially the white ash *F. americana* (Drescher and Prots 2016 – P).

Polish name (synonym I)

Jesion omszony

Polish name (synonym II)

–

Latin name (synonym I)

*Fraxinus darlingtonii*

Latin name (synonym II)

*Fraxinus pubescens*

English name (synonym I)

Downy ash

English name (synonym II)

Swamp ash

**a03. Area under assessment:**

**Poland**

acomm03.

Comments:

–

**a04. Status of the species in Poland. The species is:**

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>

native to Poland

alien, absent from Poland

alien, present in Poland only in cultivation or captivity

alien, present in Poland in the environment, not established

alien, present in Poland in the environment, established

aconf01.

Answer provided with a

low	medium	high
		<b>X</b>

level of confidence

acomm04.

Comments:

The species is found in the wild in many regions of Poland, forming spontaneous populations in anthropogenic and natural habitats. It has been regarded as an established invasive species in Poland (Dajdok and Pawlaczyk 2009, Tokarska-Guzik et al. 2012 – P).

**a05. The impact of the species on major domains. The species may have an impact on:**

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

the environmental domain

the cultivated plants domain

the domesticated animals domain

the human domain

the other domains

acomm05.

Comments:

The downy ash colonizes anthropogenic and semi-natural habitats, especially various types of communities adjacent to the roads along which it was planted (forest edges, grasslands, ruderal habitats, shrubbery, early-successional habitats). It also spreads along river valleys, encroaching herbaceous communities, willow shrubs and natural riparian forests (Dajdok and Pawlaczyk 2009, Danielewicz and Wiatrowska 2014, Drescher and Prots 2016 – P). Due to the dynamics of its populations and the fact that it colonizes new sites, especially natural habitats of Community (UE) importance: alluvial forests with *Salix sp.*, *Populus nigra*, *Alnus glutinosa*, and *Fraxinus excelsior* (priority habitat 91E0\*), and riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*

(91F0), the downy ash was classified as a species creating a very significant ecological threat, particularly for the latter habitat (Tokarska-Guzik et al. 2012 – P). As a woody plant it is unable to influence cultivated plants subjected to regular agro technical treatments. It occurs only on fallow or abandoned agricultural lands. It can grow on plantations of shrubs and fast growing trees, cultivated, for example, for fuel. It also does not affect production animals, humans or infrastructure.

## A1 | Introduction

Questions from this module assess the risk for *the species* to overcome geographical barriers and – if applicable – subsequent barriers of captivity or cultivation. This leads to *introduction*, defined as the entry of *the organism* to within the limits of *the area* and subsequently into the wild.

**a06.** The probability for *the species* to expand into Poland’s natural environments, as a result of self-propelled expansion after its earlier introduction outside of the Polish territory is:

<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input checked="" type="checkbox"/>	high

aconf02.	Answer provided with a	low	medium	high	level of confidence
				<b>X</b>	

acom06. Comments:  
 The downy ash is an established species in Poland (Tokarska-Guzik et al. 2012 – P). It is also grown or found in the wild in countries neighbouring Poland – in Germany, the Czech Republic, Slovakia, Ukraine (Drescher and Prots 2016 – P) and Belarus (Parfenov 1999 – P), including in regions directly adjacent to Poland. There is a high probability that the species will appear in Poland, because its seeds can be brought by the wind or water from borderland populations, in particular those in river valleys such as the Bug and Oder (Danielewicz and Wiatrowska 2014 – P).

**a07.** The probability for *the species* to be introduced into Poland’s natural environments by unintentional human actions is:

<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input checked="" type="checkbox"/>	high

aconf03.	Answer provided with a	low	medium	high	level of confidence
				<b>X</b>	

acom07. Comments:  
 The species is already established in Poland and cultivated (Tokarska-Guzik et al. 2012 – P). The downy ash may be confused with ash *Fraxinus excelsior* and planted (Danielewicz and Wiatrowska 2012 – P). The fruits of trees introduced by human actions into green areas can be dispersed by the wind and water. They can also be unintentionally transported to new sites as a result of various maintenance activities, in particular during the maintenance of green areas, reclamation of degraded land, pruning or removal of roadside shrubbery, with wood chips prepared for fuel or composting, or with earth excavated during road works, construction works, etc. Like many deciduous trees, the downy ash regenerates asexually (Gucker 2005 – B) by root crown sprouting, which can contribute to the spread of this species, for example from compost (Gazda 2000 – A).

**a08.** The probability for *the species* to be introduced into Poland’s natural environments by intentional human actions is:

- low
- medium
- high

aconf04. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomment08. Comments:  
 Saplings of the downy ash of different varieties are produced by nursery farms and are available on the market. They are intentionally introduced to managed green areas and reclaimed sites, including degraded land in forest areas (Czekalski 2004, Gilewska 2010 – P), and from there seeds of trees can easily spread to natural habitats. The species is kept in the collections of 16 botanical gardens and arboreta in Poland (202 trees reported on the acreage of 1744 m2); according to information provided by the staff of botanical gardens... (2018 – N) the oldest specimens were planted in 1932. Spontaneous dispersal of the downy ash was reported from three botanical gardens, and it is being removed simultaneously from those sites (Employees of botanical gardens ...2018 – N). The downy ash is a species that has been widely planted along roads, often running in the immediate vicinity of valuable natural areas. Varieties of this species are planted in urban areas, although due to invasiveness it is no longer a tree recommended for planting (Maranda 2013 – P).

## A2 | Establishment

Questions from this module assess the likelihood for *the species* to overcome survival and reproduction barriers. This leads to *establishment*, defined as the growth of a population to sufficient levels such that natural extinction within *the area* becomes highly unlikely.

**a09.** Poland provides **climate** that is:

- non-optimal
- sub-optimal
- optimal for establishment of *the species*

aconf05. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomment09. Comments:  
 The downy ash is an established species in Poland and is adapted to the local climate (Tokarska-Guzik et al. 2012 – P). The species has a wide range of tolerance to climatic conditions; it is resistant to frost and drought, both in its natural range (Gucker 2005, Prasad 2007 – B), and in Poland (Tokarska-Guzik et al. 2012, Danielewicz and Wiatrowska 2014 – P). The primary range of the species covers the central and eastern regions of North America, from the coasts of the Gulf of Mexico to the borderlands of the USA and Canada, where the downy ash grows within three climatic zones – temperate, subtropical and tropical, including areas with a climate similar to the lowland of Poland (Brakie 2013 – B, Danielewicz and Wiatrowska 2014 – P). The climate in Poland is optimal for the growth of the downy ash. The species is found throughout the country, in cultivated as well as natural sites.

**a10.** Poland provides **habitat** that is

- non-optimal
- sub-optimal
- optimal for establishment of *the species*

aconf06. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm10.

Comments:

The downy ash has a moderately wide ecological amplitude in relation to the fertility and humidity of habitats. In its natural range (Gucker 2005, Prasad 2007 – B), and outside it, it grows on various types of soil (poor, fertile, moderately wet, and wet). There are optimal habitats for the species across the Polish lowlands. The downy ash grows most often on alluvial soils in river valleys and in various types of anthropogenic habitats, in particular on roadsides and built-up areas and in their vicinity. The species prefers fertile and humid soils, on clayey and alluvial substrates, of neutral or alkaline pH; it withstands even longer waterlogging, but can also occupy drying habitats, on permeable substrates formed by sands or gravels. It is a light-demanding species, especially at a young age (Dajdok and Pawlaczyk 2009 – P, Brakie 2013 – B, Drescher and Prots 2016 – P).

### A3 | Spread

Questions from this module assess the risk of *the species* to overcoming dispersal barriers and (new) environmental barriers within Poland. This would lead to spread, in which vacant patches of suitable habitat become increasingly occupied from (an) already-established population(s) within Poland.

Note that spread is considered to be different from range expansions that stem from new introductions (covered by the Introduction module).

**a11.** The capacity of *the species* to disperse within Poland by natural means, **with no human assistance**, is:

- very low
- low
- medium
- high
- very high

aconf07.

Answer provided with a

low	medium	high <b>X</b>
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level of confidence

acomm11.

Comments:

Dispersal from a single source (data type A). The downy ash is a tree producing relatively large winged fruits dispersed by the wind. A single tree is able to produce 220-275 000 seeds. The seed density on the ground near single trees can reach 75-185 seeds/m<sup>2</sup>, and near the groups of trees – 240-270 seeds/m<sup>2</sup> (Schmiedel et al. 2013 – P). Depending on the height of the trees, topography, and direction and speed of the wind, the fruits usually fall within a distance of (40) 47-85 m from the parent tree, but a small portion of them can travel much further, at distances well above 100 m (Schmiedel et al. 2013, Drescher and Prots 2016 – P), and even approx. 640 m (Gucker 2005 – B). In river valleys fruits are transported over long distances with water, especially during floods, and then they are deposited and germinate on the banks, where they give rise to new populations. The distance of fruit dispersal by water was estimated at 163 km (Schmiedel and Tackenberg 2013 – P). In most cases the dispersal distance from a single source does not exceed 500 m (which should correspond with the ‘low’ risk score), although in river valleys, where seeds are transported by floodwaters, it can reach over 160 km (‘very high’ risk score). The adopted score is a mean for both cases. Considering that most populations disperse on a small scale, but also assuming cases of incidental, long-distance dispersal by means of river waters, significantly affecting the spread of the species, we proposed the ‘high’ score.

The increase in the number of sites at the initial stage of expansion is usually low. But when a certain threshold is reached (in the case of the Transcarpathia in Ukraine – the formation of sites in approx. 10% of the whole area) a rapid exponential growth of the population occurs (Drescher and Prots 2016 – P).

a12. The frequency of the dispersal of *the species* within Poland by **human actions** is:

<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input checked="" type="checkbox"/>	high

aconf08.	Answer provided with a	low	medium	high X	level of confidence
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acomm12. Comments:  
 Although due to the invasiveness of the species it is currently not recommended for planting, the downy ash is still used for reclamation of degraded land and planting on roadsides (Czekalski 2004, Gilewska 2010 – P), and may spontaneously spread near these areas. The downy ash is also planted in urban areas as an ornamental tree for its autumn yellow leaf colour and resistance to pollution and salinity (Maranda 2013, Danielewicz and Wiatrowska 2014, Renda and Mackoś-Iwaszko 2014 – P); it is also grown in botanical gardens and arboreta (cf. Q a08). Sometimes it is mistakenly introduced as the common ash. It is sold by ornamental plant nurseries, often advertised for its aesthetic values, and resistance to frost, air pollution, drought and diseases (e.g., Czekalski 2004 – P). Rooted shoots and parts of plants capable of sprouting, as well as fruits, can also be dispersed with soil and biomass (wood chips, compost) during earthworks, drainage works, etc.

## A4a | Impact on the environmental domain

Questions from this module qualify the consequences of *the species* on wild animals and plants, habitats and ecosystems.

Impacts are linked to the conservation concern of targets. Native species that are of conservation concern refer to keystone species, protected and/or threatened species. See, for example, Red Lists, protected species lists, or Annex II of the 92/43/EWG Directive. Ecosystems that are of conservation concern refer to natural systems that are the habitat of many threatened species. These include natural forests, dry grasslands, natural rock outcrops, sand dunes, heathlands, peat bogs, marshes, rivers & ponds that have natural banks, and estuaries (Annex I of the 92/43/EWG Directive).

Native species population declines are considered at a local scale: limited decline is considered as a (mere) drop in numbers; severe decline is considered as (near) extinction. Similarly, limited ecosystem change is considered as transient and easily reversible; severe change is considered as persistent and hardly reversible.

a13. The effect of *the species* on native species, through **predation, parasitism or herbivory** is:

<input checked="" type="checkbox"/>	inapplicable
<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input type="checkbox"/>	high

aconf09.	Answer provided with a	low	medium	high	level of confidence
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acomm13. Comments:  
 The downy ash is not a parasitic plant species.

a14. The effect of *the species* on native species, through **competition** is:

<input type="checkbox"/>	low
<input checked="" type="checkbox"/>	medium
<input type="checkbox"/>	high

aconf10.	Answer provided with a	low	medium	high X	level of confidence
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acom14.

Comments:

The downy ash is a fast-growing tree with low requirements and pioneer traits, which predestines it for the role of a taxon limiting the growth and abundance of native species, such as the pedunculate oak and the common ash (Prots et al. 2011, Drescher and Prots 2016 – P). Because of the abundant fruiting and dispersal of seeds by the wind and water, the downy ash is able to create relatively compact biogroups and patches of juvenile trees, effectively competing for soil resources and limiting the access of light to native species, especially herbaceous plants. On some sites the young generation emerges in great abundance, especially on wasteland and floodplain river valleys in alluvial habitats. Thickets and forests with the downy ash in Poland have been reported most frequently from the Odra and Warta river valleys (Danielewicz and Wiatrowska 2014 – P). The species is able to colonize and alter the structure of natural plant communities and natural habitats when growing on alluvial soils in river valleys (Botta-Dukát 2008 – P), such as alluvial forests with *Salix sp.*, *Populus nigra*, *Alnus glutinosa*, and *Fraxinus excelsior* (*Salicetum albo-fragilis*, *Populetum albae*, *Alnenion glutinoso-incanae*) type 91E0, and accompanying them alluvial willow communities *Salicetum triandro-viminalis* (Tokarska-Guzik et al. 2012, Danielewicz and Wiatrowska 2014 – P) and riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* – habitat code 91F0 (Tokarska-Guzik et al. 2012 – P). The species exerts a particularly strong effect when colonizing non-forest communities such as riverside macroforbs. Young, relatively compact groups and forest patches formed by the downy ash can develop on different types of non-forest habitats also outside the river valleys, especially near roadsides, where this tree was introduced. In such cases the downy ash may, by shading, alter local temperature and humidity, and falling leaves may cause the disappearance of light-demanding and thermophilic plant species typical of, among others, xerothermic grasslands (6210), and consequently lead to structural changes and reduction in the acreage of this type of natural habitat (Wołkowycki 2014 – P). The downy ash is also able to compete with native plant species through allelopathic interactions, because it secretes substances inhibiting the growth of other plants (Csiszár 2009 – P).

a15. The effect of *the species* on native species, through **interbreeding** is:

- no / very low
- low
- medium
- high
- very high

aconf11.

Answer provided with a

low	medium	high <b>X</b>
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level of confidence

acom15.

Comments:

So far, no hybrids of this species with other related species have been reported. The downy ash belongs to a different section and does not interbreed with the common ash native to Poland (Drescher and Prots 2016 – P).

a16. The effect of *the species* on native species by **hosting pathogens or parasites** that are harmful to them is:

- very low
- low
- medium
- high
- very high

aconf12.

Answer provided with a

low	medium <b>X</b>	high
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level of confidence

acom16.

Comments:

The species is a host to several pathogens or harmful parasites (Gucker 2005 – B), also attacking species indigenous in Poland, and therefore there is a risk of spreading these

pathogens, in particular to the common ash *Fraxinus excelsior* native to Poland. The downy ash is a host to the emerald ash borer *Agilus planipennis* (EPPO 2018 – B) and the Ascomycete fungus *Hymenoscyphus fraxineus* (EPPO 2018 – B). However, there are no data indicating the significant impact of the species on the infestation of plant species native to Poland. For example, the Ascomycete fungus *Hymenoscyphus fraxineus*, which causes dieback in the common ash in forests, shows low virulence to *Fraxinus pennsylvanica* growing in open habitats in Poland (Kowalski et al. 2015, Heinze et al. 2017 – P).

**a17.** The effect of *the species* on ecosystem integrity, by **affecting its abiotic properties** is:

<input type="checkbox"/>	low
<input checked="" type="checkbox"/>	medium
<input type="checkbox"/>	high

aconf13.	Answer provided with a	low	medium	high	level of confidence
			<input checked="" type="checkbox"/>		

acomment17. Comments:  
 There are no detailed data on the effect of the species on the abiotic properties of habitats colonized by the downy ash. In non-forest communities, however, this species certainly causes significant changes in the insolation, temperature and humidity of air and soil, which have negative effects on the conditions determining the occurrence of native herbaceous plants.

**a18.** The effect of *the species* on ecosystem integrity, by **affecting its biotic properties** is:

<input type="checkbox"/>	low
<input checked="" type="checkbox"/>	medium
<input type="checkbox"/>	high

aconf14.	Answer provided with a	low	medium	high	level of confidence
			<input checked="" type="checkbox"/>		

acomment18. Comments:  
 The downy ash can change the species composition of riparian forests through the competitive elimination of native species (the pedunculate oak and the common ash). Larger groups of young trees of downy ash, growing in non-forest habitats, cause the disappearance of native herbaceous species, in particular light-demanding and thermophilic plants, and changes in the species composition and structure of plant communities, in some cases to the complete disintegration of some of them. This concerns, for example, xerothermic grasslands and thermophilic thickets (Wołkowycki 2014 – P). Disturbance of biotic properties is due to competition for resources, space, and also through allelopathic reactions (Csiszár 2009 – P).

## A4b | Impact on the cultivated plants domain

Questions from this module qualify the consequences of *the species* for cultivated plants (e.g. crops, pastures, horticultural stock).

For the questions from this module, consequence is considered ‘low’ when presence of *the species* in (or on) a population of target plants is sporadic and/or causes little damage. Harm is considered ‘medium’ when *the organism’s* development causes local yield (or plant) losses below 20%, and ‘high’ when losses range >20%.

**a19.** The effect of *the species* on cultivated plant targets through **herbivory or parasitism** is:

<input type="checkbox"/>	inapplicable
<input checked="" type="checkbox"/>	very low
<input type="checkbox"/>	low
<input type="checkbox"/>	medium



- high
- very high

aconf15. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acommm19. Comments:  
This is not a parasitic plant species.

**a20.** The effect of *the species* on cultivated plant targets through **competition** is:

- inapplicable
- very low
- low
- medium
- high
- very high

aconf16. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acommm20. Comments:  
The downy ash does not grow on fields, in gardens, nurseries, orchards, or on maintained green areas, and does not compete with plants cultivated on this type of land. It occurs only on fallow or abandoned agricultural lands. It can colonize plantations of shrubs and fast growing trees, cultivated, for example, for fuel. Young poplar plantations are particularly susceptible to colonization by this species (Drescher and Prots 2016 – P). Poplar plantations in Poland, however, occupy a very small acreage and have little economic importance. The admixture of the downy ash in willow short rotation coppice probably does not cause a significant yield loss.  
The probability (the degree to which the species competes with cultivated plants) has been assessed as low: it is expected that the impact will concern less than 1/3 of the cultivated plant targets; the effect of the competition was estimated as low: in the worst case, the species causes local yield (or plant) losses below approx. 5%. Consequently, this corresponds with the 'very low' risk score.

**a21.** The effect of *the species* on cultivated plant targets through **interbreeding** with related species, including the plants themselves is:

- inapplicable
- no / very low
- low
- medium
- high
- very high

aconf17. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acommm21. Comments:  
The downy ash belongs to a different section, and no interbreeding with the common ash native to Poland has been reported (Drescher and Prots 2016 – P).

**a22.** The effect of *the species* on cultivated plant targets by **affecting the cultivation system's integrity** is:

- very low
- low
- medium
- high
- very high

aconf18. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm22. Comments:  
The species is a woody plant and is unable to survive on regularly managed agricultural land and anthropogenic grasslands. Therefore, the species cannot disturb the cultivation system's integrity. It occurs only on fallow or abandoned agricultural land, thus initiating succession towards tree communities.

**a23.** The effect of *the species* on cultivated plant targets by hosting **pathogens or parasites** that are harmful to them is:

- very low
- low
- medium
- high
- very high

aconf19. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm23. Comments:  
The species is not a vector of pathogens or parasites that are harmful to cultivated plants. The downy ash is a host to several pathogens or harmful parasites (Gucker 2005 – B), also attacking plants indigenous in Poland, e.g., the emerald ash borer *Agrilus planipennis* (EPPO 2018 – B) and the Ascomycete fungus *Hymenoscyphus fraxineus* (EPPO 2018 – B) infesting the common ash. However, there are no data indicating the significant impact of the species on the infestation of plant species native to Poland, including saplings grown in forest nurseries. For example, the Ascomycete fungus *Hymenoscyphus fraxineus*, which causes the dieback of the common ash in forests, shows low virulence to *Fraxinus pennsylvanica* growing in open habitats in Poland.

### A4c | Impact on the domesticated animals domain

Questions from this module qualify the consequences of *the organism* on domesticated animals (e.g. production animals, companion animals). It deals with both the well-being of individual animals and the productivity of animal populations.

**a24.** The effect of *the species* on individual animal health or animal production, through **predation or parasitism** is:

- inapplicable
- very low
- low
- medium
- high
- very high

aconf20. Answer provided with a 

low	medium	high
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 level of confidence

acomm24. Comments:  
The downy ash is not a parasitic plant species.

**a25.** The effect of *the species* on individual animal health or animal production, by having properties that are hazardous upon **contact**, is:

- very low
- low

- medium
- high
- very high

aconf21. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acommm25. Comments:  
The species has no toxic properties. There are no data indicating its negative effect on production animals.

**a26.** The effect of *the species* on individual animal health or animal production, by hosting **pathogens or parasites** that are harmful to them, is:

- inapplicable
- very low
- low
- medium
- high
- very high

aconf22. Answer provided with a 

low	medium	high
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 level of confidence

acommm26. Comments:  
The species is not involved in any way as an indirect host in the life cycles of animal pathogens and parasites.

## A4d | Impact on the human domain

Questions from this module qualify the consequences of *the organism* on humans. It deals with human health, being defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (definition adopted from the World Health Organization).

**a27.** The effect of *the species* on human health through **parasitism** is:

- inapplicable
- very low
- low
- medium
- high
- vert high

aconf23. Answer provided with a 

low	medium	high
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 level of confidence

acommm27. Comments:  
The downy ash is a plant and is not a parasitic species.

**a28.** The effect of *the species* on human health, by having properties that are hazardous upon **contact**, is:

- very low
- low
- medium
- high
- very high

aconf24. Answer provided with a 

low	medium	high X
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 level of confidence

acomm28. Comments:  
The downy ash does not create any hazard to human health. The plant does not have any known allergenic or toxic properties.

a29. The effect of *the species* on human health, by hosting **pathogens or parasites** that are harmful to humans, is:

- inapplicable
- very low
- low
- medium
- high
- very high

aconf25. Answer provided with a 

low	medium	high
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 level of confidence

acomm29. Comments:  
The species does not host any pathogens or parasites that are harmful to humans.

### A4e | Impact on other domains

Questions from this module qualify the consequences of *the species* on targets not considered in modules A4a-d.

a30. The effect of *the species* on causing damage to **infrastructure** is:

- very low
- low
- medium
- high
- very high

aconf26. Answer provided with a 

low	medium	high X
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 level of confidence

acomm30. Comments:  
Negative effects of the species on infrastructure have not been reported.

### A5a | Impact on ecosystem services

Questions from this module qualify the consequences of *the organism* on ecosystem services. Ecosystem services are classified according to the Common International Classification of Ecosystem Services, which also includes many examples (CICES Version 4.3). Note that the answers to these questions are not used in the calculation of the overall risk score (which deals with ecosystems in a different way), but can be considered when decisions are made about management of *the species*.

a31. The effect of *the species* on **provisioning services** is:

- significantly negative
- moderately negative
- neutral
- moderately positive
- significantly positive

aconf27. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm31. Comments:  
The species does not interfere with plant cultivation or animal production, nor does it affect the supply of water, or most other provisioning services. It may only have a negative impact on plantations of fast-growing trees cultivated, for example, for fuel. However, such plantations in Poland have little economic importance.

**a32.** The effect of *the species* on **regulation and maintenance services** is:

- significantly negative
- moderately negative
- neutral
- moderately positive
- significantly positive

aconf28. Answer provided with a 

low	medium <b>X</b>	high
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 level of confidence

acomm32. Comments:  
The downy ash may have both positive and negative effects on regulation services. The species is used for the reclamation of degraded habitats, where it prevents erosion and promotes soil formation. In floodplain river valleys, groups and patches of this species growing on non-forest habitats may sometimes create an obstacle to the flow of floating ice and flood waters, intensifying the scale of flooding.

**a33.** The effect of *the species* on **cultural services** is:

- significantly negative
- moderately negative
- neutral
- moderately positive
- significantly positive

aconf29. Answer provided with a 

low	medium <b>X</b>	high
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 level of confidence

acomm33. Comments:  
The downy ash in Poland's climate is among the earliest-discolouring tree species, and its leaves change colour as early as the end of summer (August). It is often valued for bringing attractive features to urban landscape (Renda and Mackoś-Iwaszko 2014 – P). It is planted in green areas, including roadsides, one reason being its attractive colour (leaves turn vivid yellow), which can be perceived in positive terms and increase the appeal and recreational value of rural and urban landscapes.

## A5b | Effect of climate change on the risk assessment of the negative impact of the species

Below, each of the *Harmonia*<sup>PL</sup> modules is revisited under the premise of the future climate. The proposed time horizon is the mid-21st century. We suggest taking into account the reports of the Intergovernmental Panel on Climate Change. Specifically, the expected changes in atmospheric variables listed in its 2013 report on the physical science basis may be used for this purpose. The global temperature is expected to rise by 1 to 2°C by 2046-2065.

Note that the answers to these questions are not used in the calculation of the overall risk score, but can be but can be considered when decisions are made about management of *the species*.

**a34. INTRODUCTION** – Due to climate change, the probability for *the species* to overcome geographical barriers and – if applicable – subsequent barriers of captivity or cultivation in Poland will:

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf30. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm34. Comments:  
The species is grown and established in Poland in the wild (Tokarska-Guzik et al. 2012 – P). It is a frost-resistant tree, and the climate of Poland is optimal for its development. It also grows in most of the countries neighbouring Poland, both in cultivation and in the wild. The species has overcome geographical barriers because of deliberate introduction and acclimatization. Climate change will not have any effect on the introduction of this plant species and its persistence in cultivation and in the wild.

**a35. ESTABLISHMENT** – Due to climate change, the probability for *the species* to overcome barriers that have prevented its survival and reproduction in Poland will:

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf31. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm35. Comments:  
The species is already established (Tokarska-Guzik et al. 2012 – P). The climate and habitats in Poland are optimal for the growth of the downy ash. The expected climate change will have no effect in this regard.

**a36. SPREAD** – Due to climate change, the probability for *the species* to overcome barriers that have prevented its spread in Poland will:

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf32. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm36. Comments:  
The species is able to spread effectively in Poland in the present climate. Temperature is not a limiting factor. The expected climate change will have no effect in this regard.

**a37. IMPACT ON THE ENVIRONMENTAL DOMAIN** – Due to climate change, the consequences of *the species* on wild animals and plants, habitats and ecosystems in Poland will:

- decrease significantly
- decrease moderately
- not change

- increase moderately
- increase significantly

aconf33. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm37. Comments:  
The species is able to compete effectively with native species in the present climate. Climate change will not change its reproductive success, competitiveness or impact on abiotic and biotic properties or the structure of ecosystems.

**a38. IMPACT ON THE CULTIVATED PLANTS DOMAIN** – Due to climate change, the consequences of *the species* on cultivated plants and plant domain in Poland will:

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf34. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm38. Comments:  
The species (except plantations of fast-growing trees) has no impact on cultivated plants and plant production in Poland. The expected climate change will have no effect in this regard.

**a39. IMPACT ON THE DOMESTICATED ANIMALS DOMAIN** – Due to climate change, the consequences of *the species* on domesticated animals and animal production in Poland will:

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf35. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm39. Comments:  
The species has no impact on animal production. The expected climate change will have no effect in this regard.

**a40. IMPACT ON THE HUMAN DOMAIN** – Due to climate change, the consequences of *the species* on human in Poland will:

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf36. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm40. Comments:  
The species has no impact on the human domain. The expected climate change will have no effect in this regard.

**a41. IMPACT ON OTHER DOMAINS** – Due to climate change, the consequences of *the species* on other domains in Poland will:

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf37. Answer provided with a 

low	medium	high <b>X</b>
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 level of confidence

acomm41. Comments:  
The species has no impact on infrastructure. The expected climate change will have no effect in this regard.

## Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	1.00	1.00
Establishment (questions: a09-a10)	1.00	1.00
Spread (questions: a11-a12)	0.88	1.00
Environmental impact (questions: a13-a18)	0.40	0.70
Cultivated plants impact (questions: a19-a23)	0.00	1.00
Domesticated animals impact (questions: a24-a26)	0.00	1.00
Human impact (questions: a27-a29)	0.00	1.00
Other impact (questions: a30)	0.00	1.00
Invasion (questions: a06-a12)	0.96	1.00
Impact (questions: a13-a30)	0.40	0.94
Overall risk score	0.38	
Category of invasiveness	potentially invasive alien species	

## A6 | Comments

This assessment is based on information available at the time of its completion. It has to be taken into account. However, that biological invasions are, by definition, very dynamic and unpredictable. This unpredictability includes assessing the consequences of introductions of new alien species and detecting their negative impact. As a result, the assessment of the species may change in time. For this reason it is recommended that it regularly repeated.

acomm42. Comments:  
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### **3. Unpublished data (N)**

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### **4. Other (I)**

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