Appendix A

Harmonia^{+PL} – 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. Aleksandra Halarewicz – external expert
2. Anna Otręba
3. Władysław Danielewicz

acomm01. Comments:

	degree	affiliation	assessment date
(1)	dr hab. inż.	Department of Botany and Plant Ecology, Wrocław University of Environmental and Life Sciences	24-01-2018
(2)	dr inż.	Kampinos National Park	07-03-2018
(3)	dr hab.	Department of Forest Botany, Faculty of Forestry, Poznań University of Life Sciences	27-01-2018

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

Polish name: Czeremcha amerykańska

Latin name: ***Padus serotina*** (Ehrh.) Borkh.

English name: Black cherry

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acomm02. Comments:

In Polish publications, the preferred Latin name of the species is *Padus serotina* according to Flowering plants and pteridophytes of Poland – a checklist (Mirek et al. 2002 – P), whereas in English-language publications its synonym *Prunus serotina* in accordance with Flora Europea (Tutin et al. 1968 – P) is used and widely accepted (Marquis 1990, Starfinger 1997, Vanhellemont 2009 – P, The Plant List 2013, CABI 2017 – B).

Other known synonyms of the Latin name are: *Cerasus capolin* Ser. Ex DC., *Cerasus longifolius* Nutt. ex Torr. & A. Gray, *Prunus capui* Cav., *Prunus salicifolia* Kunth (CABI 2017 – B) and synonym of the English name: American black cherry, Mountain black cherry, Rum cherry (CABI 2017 – B, Vanhellemont 2009 – P).

Polish name (synonym I)	Polish name (synonym II)
czeremcha późna	–
Latin name (synonym I)	**Latin name (synonym II)**
Prunus serotina	*Cerasus capolin*
English name (synonym I)	**English name (synonym II)**
Wild black cherry	Wild cherry

a03. **Area** under assessment:

Poland

acomm03. Comments:

–

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

	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
X	alien, present in Poland in the environment, established

aconf01. Answer provided with a

low	medium	high
		X

level of confidence

acomm04. Comments:

Black cherry occurs throughout Poland, mainly in its central and south-west part (Stypiński 1979, Danielewicz 1994, Zając A. and Zając M. 2001, Tokarska-Guzik 2003, 2005, Halarewicz 2012a, Bijak et al. 2014 – P). It is rarely reported in north-west Poland (Zając A. and Zając M. 2015 – B). The earliest information on black cherry capability to reproduce generatively and spread spontaneously were published in the mid-20th century (Dominik 1947 – P). Twenty years later, it was classified as the species established in semi-natural habitats (Kornaś 1968 – P). *Padus serotina* in Aborteum in Rogowo was the first woody species of foreign origin, which produced the second generation without human interference (Tumiłowicz 1992 – P). Tests performed in Brandenburg, Germany confirmed that black cherry could establish very quickly in Europe. This species was classified as an established species less than 30 years after its introduction, whereas the average time of 150 years is typical for woody plant species (Starfinger 1997 – P). Nowadays, black cherry in Poland is classified as an established, invasive species (Tokarska-Guzik et al. 2012 – P).

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

X	the environmental domain
X	the cultivated plants domain
X	the domesticated animals domain
X	the human domain
X	the other domains

acomm05. Comments:

Black cherry has a negative impact mainly on the natural environment and forest economy (impact zone – the cultivated plant domain). This species has a multi-stage and long-term impact (Cuddington and Hastings 2004 – P), which is determined by the existing plant vegetation (Starfinger et al. 2003, Chabrerie et al. 2008 – P). Although *P. serotina* is widespread in its introduced range, the scope of its impact on the natural environment has not been thoroughly examined and documented (Starfinger et al. 2003, Aerts et al. 2017 – P). In many European countries (the Netherlands, Germany, Denmark), black cherry is recognised as "forest weed" because of its dense understory, which restrains regeneration and growth of native woody plant species, particularly the ones requiring a lot of sunlight, such as oak or pine (Starfinger et al. 2003, Juhász 2008 – P).

Dominance of *P. serotina* in woodland communities causes ecological and economic losses. It is demonstrated by the transformation of internal structure, dynamics and the composition of communities and usually include common species (Starfinger 1997, Verheyen et al. 2007, Chabrerie et al. 2010, Halarewicz and Żołnierz 2014, Halarewicz and Pruchniewicz 2015 – P). The occurrence of this species in protected habitats, such as heathlands, poses a serious threat to the conservation of biodiversity (Starfinger 2010 – B, GIOŚ 2012 – B). A significant economic problem for production forests is more expensive maintenance of forest plantations and greenwood caused by required removal of wilding and undergrowth of *P. serotina* (Halarewicz 2011 – P) and additional treatments to restore forests after cutting out understory bush species (Tokarska-Guzik et al. 2012 – P).

Black cherry spontaneously occupies other areas beyond forests and appears in fields which are not cultivated (Adamczak 2007 – P), field margins (Faliński 1997, Deckers et al. 2005 – P) or urban green areas (Jackowiak 1990, Chojnacki 1991, Honnay et al. 1999, Bąbelewski 2014 – P). This species also has a negative impact on facilities, such as building plots, power lines, or forest roads.

Moreover, shoots, leaves and seeds of this species contain cyanogenic glycosides (prunasin and amygdalin), which can be harmful to animals and humans (Marquis 1990 – P, CBIF 2018 – B).

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:

	low
	medium
X	high

aconf02. Answer provided with a

low	medium	high	level of confidence
		X	

acomm06. Comments:

Black cherry occurs in nearly all neighbouring countries of Poland, and in Germany and the Czech Republic, it is an invasive species (CABI 2017 – B). As this species is a zoochore, its seeds are dispersed by animals (inter alia, Bartkowiak 1970, Marquis 1990, Kurek et al. 2015 – P), its further dispersal from e.g. forest and gardens within border areas in Germany and the Czech Republic, however no detailed data on this issue are available. The current route of spontaneous geographical expansion of the species in Poland has usually concentration around sites of its introduction as part of the planned forest economy (Szwagrzyk 2000, Bijak et al. 2014, Danielewicz and Wiatrowska 2014 – P). The intense dispersion of *P. serotina* from sites of its introduction was also observed in many parts of

Europe (inter alia, Danielewicz 1994, Starfinger et al. 2003, Deckers et al. 2005, Vanhellemont et al. 2009, Otręba and Mędrzycki 2009, Wołkowycki and Próchnicki 2015 – P, Otręba 2012 – N). Some authors assessed that the analysed species has not achieved the maximum establishment level in Europe (Zerbe and Wirth 2006 – P).

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

	low
	medium
X	high

aconf03.	Answer provided with a	low	medium	high **X**	level of confidence

acomm07. Comments:

Accidental dispersion of seeds, also probable, would not have a significant impact at the current dispersion level of this species in Poland. Numerous fruits of *P. serotina* are transported by birds (Bartkowiak 1970 – P) or mammals (Starfinger 1997, Kurek and Holeksa 2011 – P). Ornitochory, that is, dispersion of diasporas by birds, is dominating (Kowarik 1995, Deckers et al. 2005 – P).

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

	low
	medium
X	high

aconf04.	Answer provided with a	low	medium	high **X**	level of confidence

acomm08. Comments:

There are no legal objections to plant black cherry as this species is not specified in Annex to the Regulation of the Polish Minister of Environment of 2001 (Regulation… 2011 – I). According to guidelines from publications of Principles of silviculture, State Forests are assumed to discontinue planting of black cherry at the beginning of the 21st century. Black cherry was deleted from the list of auxiliary species by means of Principles of silviculture only in 2003 – P).

Padus serotina is quite an attractive species to be planted in private gardens because it is not very demanding with reference to soil fertility. This species is characterized by a quick growth rate and an attractive appearance during flowering and autumn discolouration. Its fruits care edible (Bugała 1991, Seneta and Dolatowski 2011 – P). Due to its invasive nature in the natural environment, this species has been included on the list of species, for which it was agreed not to offer this species for sale and cultivate in Poland (Heywood and Brunel 2008, Kodeks dobrych praktyk 2014 – P). These agreements are not obligatory, but voluntary for people who have accepted the Code. Selling seedlings (e.g. Szkółka Konieczko 2018 – I), getting them for free from spontaneous restoration of the species and lack of social awareness results in further planting of this species. The ban on introducing this species in new stands can be regulated by proper laws not only imposing some restrictions, but also including the propagation of information and law enforcement (inter alia Namura-Ochalska and Borowa 2015 – 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
X	optimal for establishment of *the species*

aconf05.	Answer provided with a	low	medium	high **X**	level of confidence

acomm09. Comments:

Black cherry has a wide amplitude of ecological requirements. In North America, it grows in three climate zones: warm temperate, subtropics and tropics, from maritime, continental to dry climate where it reaches the end of its range in the western part (Mityk 1975, Tumiłowicz 1977, Marquis 1990 – P). Black cherry can resist frost and freeze. It belongs to species growing in the climate with the average minimum temperature from -35°C to -20°C (Hereźniak 1992 – P). Moreover, it shows high resistance to drought (Stypiński 1977, Łukasiewicz 1989 – P). The northern part of its natural range, including Allegheny Plateau, where black cherry grows to its maximum size, is in the zone of optimal climatic conditions according to maps of climatic similarities between Poland and rest of the world (*Harmonia*$^{+PL}$). According to this map, a considerable part of the species range is within the zone of unfavourable climatic conditions. In Europe, the introduced range of *P. serotina* mainly includes in maritime warm temperate and transitional climate (CABI 2017 – B). This occurrence range is connected with much narrower range of climate variations than in North America (Vanhellemont 2009 – P) This species can survive in climatic conditions in Poland.

a10. Poland provides **habitat** that is

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

aconf06.	Answer provided with a	low	medium	high **X**	level of confidence

acomm10. Comments:

In Europe and Poland, black cherry, like in its natural range of occurrence, grows on a wide variety of soils regarding moisture content and trophic level, from dry soils to eroded wet soils. It usually grows in sandy and poor soils of acidic pH, to which this species was introduced (Starfinger 1997, Closset-Kopp et al. 2007, Halarewicz 2012a – P). However, the most effective and fastest spread of this species is observed in mesotrophic soils – rusty, brown soils (Stypiński 1979, Rutkowski et al. 2002 – P, Otręba 2012 – N), and moist soils are avoided by this species (Stypiński 1979, Closset-Kopp et al. 2007, Halarewicz and Kawałko 2014, Halarewicz and Bączek 2016 – P). This species is usually reported on sites of mixed coniferous forest and mixed forest (Stypiński 1979, Danielewicz 1994, Bijak et al. 2014, Halarewicz and Kawałko 2014 – P). But, a well-developed layer of undergrowth in humid mixed coniferous forest and the moss layer in fresh coniferous forest may considerably limit the intensity of *P. serotina* regeneration in the mentioned forest phytocoenosis (Halarewicz 2011 – P). Moreover, this species is dynamically widespread in forests changed for economic reasons into forests of Scots pine, plantations of Austrian pine *Pinus nigra* or European larch *Larix decidua* (Starfinger et al. 2003, Juhász 2008, Rutkowski et al. 2002 – P, Otręba 2012 – N). This species often occupies open stands: fields which are not cultivated, meadows, grasslands, heathlands, eroded marshes and field margins (Deckers et al 2005, Adamczak 2007, Juhász 2008, Bułaj et al. 2017 – P).

Poland has optimal conditions for establishment and expansion of black cherry. This species only does not grow in higher mountain regions (Kosiński 2007, Zając A. and Zając M. 2015 – 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
X	low
	medium
	high
	very high

aconf07.	Answer provided with a	low	medium **X**	high	level of confidence

acomm11. Comments:

Data on dispersion from a single source (A-type data) show very low ability of the species to broaden its occurrence range. Numerous fruits of *P. serotina* (1500-6000 per tree) are barochoric, their seeds are falling from a parent tree to the ground, or endochoric – excreted by animals (Pairon et al. 2006 – P). Most fruits by gravity fall far from their parent tree within a distance of 5-10 m (very low dispersion) (Hoppes 1988 – P). Birds disperse 20% of fruit sets (Pairon et al. 2006 – P). Fruit is present in avian digestive track for a relatively short time, ca. 30 minutes (Podbielkowski 1995 – P), and seeds are found within a distance up to 100 m from the parent tree (low dispersion) (Pairon 2007 – N). In German rural landscape, the dispersal rate of black cherry was defined as 22.5 m/year. In forest ecosystems, this rate is much lower, equal to 6 m/year in the monoculture of pine, and 12 m/year in mixed forest (Kowarik 1995 as cited in Starfinger 1997, Deckers et al. 2005 – P). According to data from Poland concerning the Kampinos forest, the dispersal rate of this species from the known source is from 2.5 to 5 m/year depending on environmental conditions (Otręba 2012 – N).

The spontaneous dispersion of black cherry is facilitated by the presence of supports for perched birds (e.g. utility poles, district heating pipes) near places of seedlings (Adamczak 2007, Kurek et al. 2015 – P).

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

	low
	medium
X	high

aconf08.	Answer provided with a	low	medium **X**	high	level of confidence

acomm12. Comments:

In the mid of the 20th century, *P. serotina* was spreading locally in Poland, around the places of its introduction. Massive introduction of this species as an element of the forest economy lasting from the middle of the 20th century, led to a rapid expansion of *P. serotina* throughout Poland, except for the Carpathian Mountain (Szwagrzyk 2000, Tokarska-Guzik 2005 – P).

As planting of black cherry as an ornament plant is not prohibited by law (see Comment a08), and seeds can be unintentionally transferred (see Comment a07), new sources of seedlings can be formed. The most important pathways of secondary dispersion of *P. serotina*, through human actions are: transport of diaspores along transportation routes in forests (Halarewicz and Bączek 2016 – N) and poles of power lines in arable lands (Kurek et al. 2015 – P). Dispersion of seeds by humans while destroying fruiting individuals of the species is assumed as probable.

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**:

- [X] inapplicable
- [ ] low
- [ ] medium
- [ ] high

aconf09.	Answer provided with a	low	medium	high	level of confidence

acomm13. Comments:

This species is a plant which does not affect the native species through predation, parasitism or herbivory.

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

- [ ] low
- [ ] medium
- [X] high

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

acomm14. Comments:

Black cherry uses different mechanisms of interspecific competition. This species is prone to competition from coniferous species of trees and shrubs. Its introduced range does not include mixed leafy forests (Rutkowski et al. 2002, Vanhellemont et al. 2009 – P, Otręba 2012 – N).

In forest phytocoenoses prone to changes, such as pine forests growing in formerly arable grounds, distorted mixed coniferous forests and mixed forests, forests on sites of oaks, the understory of *P. serotina* is very well-developed and shades the forest floor, and litter from the species leaves additionally impedes light penetration (Rutkowski et al. 2002, Starfinger et al. 2003, Juhász 2008, Halarewicz 2012a, Otręba 2014 – P). Thus, the size of covering and the number of species in the undergrowth and the moss layer are reduced. This mainly refers to the widely spread light-loving species (Stypiński 1977, Danielewicz 1994, Starfinger 1997, Chabrerie et al. 2010, Halarewicz 2012a, Namura-Ochalska 2012, Halarewicz and Pruchniewicz 2015 – P).

Leaf litter of *P. serotina* has a higher decomposition rate and higher content of nitrogen and phosphorus when compared to leaves of other deciduous trees (Lorenz et al. 2004, Vanderhoeven et al. 2005, Koutika et al. 2007, Chabrerie et al. 2008 – P). Decomposition of black cherry litter can indirectly contribute to displacement the species of lower nutritional requirements and the appearance of plants on fertile habitats (Verheyen et al. 2007, Halarewicz and Żołnierz 2014, Halarewicz et al. 2017b – P).

Black cherry limits the growth of coexisting young plants which tolerate light and tropic conditions but lose the competition as their bank of seedlings is smaller (Closset-Kopp et al.

2007, Chabrerie et al. 2010 – P). Additionally, individual development stages of *P. serotina* adjust their growth rate to light regime and extend their advantage over coexisting species when the light conditions are improved (Closset-Kopp et al. 2007 – P).

Padus serotina has a negative impact on representatives of native flora also by allelopathic interactions. Chemical compounds released by roots (Bielinis et al. 2010 – P) and present in leaves reduce germination of seeds of coexisting species (Drogoszewski and Barzdajn 1984 – P, Bączek and Halarewicz 2018 – N).

Considering the current distribution of the species, its effect on native species through competition seems to be medium because in accordance with *Harmonia*$^{+PL}$ protocol, it causes limited population declines in native species of conservation concern, or severe population declines in other native species. However, as the analysed species tends to hinder the process of secondary succession, e.g. in young pine forests in formerly arable grounds, the impact assessment was overrated.

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

	no / very low
X	low
	medium
	high
	very high

aconf11.	Answer provided with a	low	medium **X**	high	level of confidence

acomm15. Comments:

The formation of hybrids within the *Padus* genus is quite often (Cici and Van Acker 2010 – P). Nowadays, there are no detailed data on black cherry interbreeding with related species in Poland (Pliszko 2015 – P). But hybrids of black cherry *P. serotina*, bird cherry *P. avium* and bitter berry *P. virginiana* are possible (Seneta and Dolatowski 2011 – P). Flowering of black cherry occurs late, at the end of spring within the introduced range – in May and June, a month later than bird cherry and introduced bitter berry. Thus, interbreeding of these species is more difficult.

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

	very low
	low
X	medium
	high
	very high

aconf12.	Answer provided with a	low	medium **X**	high	level of confidence

acomm16. Comments:

Six species of pathogenic microfungi are observed on black cherry in the introduced range. This plant is attacked by *Monilinia seaveri* (Rehm) Honey (Halarewicz and Pląskowska 2011 – P) and *Monilinia linhartiana* Sacco (Ruszkiewicz-Michalska and Mułenko 2003 – P), which cause brown rot of stone fruit-bearing trees. The first pathogen is a monophage, which probably entered Poland with the species from America (Halarewicz 2012a – P) and develops only on *P. serotina*. It does not pose a threat to native species of plants. *Monilinia linhartiana* is a parasite living on representatives of *Prunus* genus (Batra 1991 – P) and its presence on *P. serotina* can facilitate carrying and spreading of this disease. Moreover, leaf curl symptoms – the fungus disease caused by *Taphrina deformans* (Berk.) Tul. are observed on leaves of black cherry. This plant pathogen occurs on peaches and nectarines (first observations were made in Lower Silesia region) (Halarewicz and Mazurek 2017 – A). Other three microfungi occurring on *P. serotina* are rare and have no significant economic impact (Ruszkiewicz-Michalska and Mułenko 2003 – P).

Wood of black cherry is occupied by 42 identified species of macrofungi. A group of the following five species of large-fructification fungi, which are widespread in the world, dominated: *Chondrostereum purpureum*, *Coniophora arida*, *Bjerkandera adusta*, *Cylindrobasidium evolvens* and *Stereum rugosum*. They are responsible for white rot of wood. *Chondrostereum purpureum* also causes silver leaf of fruit and wild trees. *Stereum rugosum* is a parasite which causes bleeding broadleaf crust is mainly present on trunks. Smoky polypore *B. adusta* is considered as a parasite of weakness, even though it is more commonly known as a saprobiont, like two other species: *C. arida* and *C. evolvens* (Szczepkowski 2016 – N, Marciszewska et al. 2018 – P).

Leaves and fruits of black cherry host 10 species of polyphagous insects and three species of specialized herbivore insects (Halarewicz 2012a – P). Among wood insects feeding on leaves of black cherry, *Gonioctena quinquepunctata* Fabr. appears abundantly and is harmful. It is also present on different types of understory species, such as bird cherry *Padus avium*, rowan *Sorbus aucuparia*, alder *Alnus* sp., willow *Salix* sp. (Halarewicz and Jackowski 2011, Mąderek et al. 2015 – P), and bird-cherry ermine *Yponomeuta evonymellus* L., so far monophage *P. padus* (Łukowski et al. 2017 – P). Pests found on fruits of *P. serotina* are representatives of coleopterons: cherry weevil *Furcipes retirostris* L. and *Rhynchites cupreus* L. (Sądej et al. 2003, Pairon et al. 2006, Halarewicz 2016, Vanhellemont et al. 2014 – P), and *Drozophila suzukii* Matsumara – a species of true flies included on the list A2 EPPO (EPPO 2018 – B), living on plants of *Prunus* genus. The consequence of stone fruits damage caused by *D. suzukii* is premature fruit drop (Poyet et al. 2014, Halarewicz 2016 – P).

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

	low
	medium
X	high

aconf13. Answer provided with a

low	medium	high
	X	

level of confidence

acomm17. Comments:

Studies carried out in recent decades have shown the impact of black cherry on soil environment; however, the obtained results are not always unequivocal. Litter from the species leaves is characterised by high content of nitrogen, magnesium and potassium and high decomposition rate (Muys et al. 1992, Lorenz et al. 2004 – P). Stands with very well-developed understory of black cherry show an increase in nitrogen and phosphorus content in the organic layer of soil and lower C:N ratio (Vanderhoeven et al. 2005, Koutika et al. 2007, Chabrerie et al. 2008, Dessonville et al. 2008, Halarewicz and Pruchniewicz 2015 – P). The species impact on pH of forest soil is still disputable. Comparison of soil sampled from the surface of *P. serotina* and soil without this species indicated lower (Starfinger et al. 2003, Chabrerie et al. 2008 – P), higher (Kowalski 1988, Plichta 1997, Vanderhoeven et al. 2005, Halarewicz et al. 2017a – P) or similar (Verheyen et al. 2007 – P) pH values of soil. The above discrepancies are probably developed from conclusions drawn from results of a single collecting of soil samples, without taking into account changes in soil parameters (Halarewicz et al. 2017a – P).

To sum it up, considering the current distribution of the species, its impact on abiotic properties (analysed on the basis of soil properties) is assessed as medium because in accordance with *Harmonia*$^{+PL}$ protocol, it causes hardly reversible process changes in ecosystems that are not of conservation concern. However, taking into account the possible expansion of the species, the negative impact on ecosystems with rare and endangered species and habitats may increase, which suggests that high consequences should be estimated.

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

	low
	medium
X	high

aconf14.	Answer provided with a	low	medium	high **X**	level of confidence

acomm18. Comments:

As black cherry is becoming widespread and affects the regeneration of native woody plant species, it is recognised as "wood weed" in many European countries (the Netherlands, Germany, Denmark) (Muys et al. 1992 – P, Starfinger 2010 – B). The negative impact of the species refers to natural restoration and species planted in forests (inter alia, Starfinger et al. 2003, Juhász 2008 – P). The most serious disturbances of forest communities are observed in poor sites of pine forests with a dominating presence of *P. serotina*. These disturbances refer to changes in vertical structure of forests, reduction of area covered by undergrowth (by 30%) and by moss layer (by nearly 40%) and displacement of typical forest taxa (Halarewicz and Pruchniewicz 2015 – P). Another tendency also observed in forest communities with black cherry is the appearance of nitrophilic synantrophic species (Verheyen et al. 2007, Chabrerie et al. 2010, Halarewicz and Żołnierz 2014, Halarewicz and Pruchniewicz 2015 – P).

The invasions of black cherry deteriorates conditions of protected plant communities. Currently, the presence of black cherry has been confirmed in 10 national parks (Najberek and Solarz 2011, Bomanowska et al. 2014 – P), however this information should be updated.

Some authors suggest that *P. serotina* modifies the cycle of nitrogen, phosphorus and carbon in the ecosystem, in which it appears and has a negative impact on the content of biogens in leaves and needles of coexisting native species (Aerts et al. 2017 – P). But no impact was found on annual increment of pine (Ludwisiak and Bijak 2014 – P).

Black cherry was accepted by native insects as a host plant and is an important element of the trophic network. The first list of herbivory entomofauna living on black cherry in Poland contains 23 taxa and requires further revision (Halarewicz 2012b – P). Polyphagous species of coleopterans and butterflies dominate among herbivore insects (Nowakowska and Halarewicz 2006a and b, Halarewicz 2012a, Halarewicz 2016 – P). Many insects visit nectaries of *P. serotina*, and numerous flowers are mainly pollinated by hymenoptera and hoverflies belonging to true flies (Jabłoński 1998 – P). As a consequence, chances of pollinating native species of plants at the same time are smaller.

To sum it up, considering the current distribution of the species, its impact on biotic properties of ecosystems can assessed as medium because in accordance with *Harmonia*$^{+PL}$ protocol, it mainly causes process changes in ecosystems that are not of conservation concern. However, taking into account the possible expansion of the species, the negative impact on ecosystems with rare and endangered species and habitats may increase, which suggests that high consequences should be estimated.

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:

	inapplicable
X	very low
	low
	medium
	high
	very high

aconf15.	Answer provided with a	low	medium	high **X**	level of confidence

acomm19. Comments:

This species is a plant, which exhibits no parasitic properties.

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

	inapplicable
	very low
	low
	medium
X	high
	very high

aconf16.	Answer provided with a	low	medium **X**	high	level of confidence

acomm20. Comments:

This species can affect plant crops in the following areas:

(1) Forests – wilding and sapling of *P. serotina* deteriorate growth conditions of forest plantations and greenwood (Halarewicz 2011 – P), dense understory of black cherry, in forest ecosystems prone to invasions of this species, reduce regeneration of native species of trees and shrubs (Namura-Ochalska 2012, Otręba 2016 – P). Black cherry adversely affects forest regeneration by competing for light (Muys et al. 1992, Starfinger et al. 2003, Vanhellemont 2009 – P), and probably for food resources (Robakowski et al. 2012, Aerts et al. 2017 – P). Allelopathic interactions related to the content of prunasin and amygdalin (Csiszár 2009 – P) have not been confirmed under experimental conditions (Robakowski and Bielinis 2011 – P). Although there are no detailed data on numerous problems on regeneration of forest stands and maintenance of plantations in areas invaded by *P. serotina*, the risk from the presence of this species is assessed as high and increasing (Kołodziej and Bilański 2003 – P).

(2) Meadows and grasslands – regularly used areas are not at risk of being invaded by black cherry because spontaneously growing seedlings will be cut down during grazing or mowing. The risk is faced by meadows and grasslands which are not used any more. If they are adjacent to sources of fruit dispersion (e.g. forest communities with dense understory of black cherry), extensive areas are likely to be overgrown which was observed near Włodawa (Otręba 2017a – A). Restoration of such areas to their previous function requires considerable workloads.

In accordance with *Harmonia*$^{+PL}$ protocol, the likelihood of negative impact of black cherry is assessed as high because it can refer to more than 2/3 of forest areas prone to invasion of this species. The consequence is assessed as medium, which in result means high impact of the species on plant crops, particularly forests.

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

	inapplicable
	no / very low
X	low
	medium
	high
	very high

aconf17.	Answer provided with a	low	medium **X**	high	level of confidence

acomm21.	Comments: There are no detailed data on black cherry interbreeding with related species (Pliszko 2015 – P). But hybrids of black cherry *Padus serotina*, bird cherry *P. avium* and bitter berry *P. virginiana* are possible (Seneta and Dolatowski 2011 – P).

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

	very low
	low
	medium
X	high
	very high

aconf18.	Answer provided with a	low	medium **X**	high	level of confidence

acomm22.	Comments: Forests with the dominance of black cherry in the understory experience temporary plateau of ecological succession and inhibition of regeneration of native woody plant species (Starfinger et al. 2003, Closset-Kopp et al. 2007, Vanhellemont 2009, Chabrerie et al. 2010, Namura-Ochalska and Borowa 2015 – P). Moreover, self-sowing of this species is observed in formerly arable grounds adjacent to forests, in which they are present on a massive scale (Otręba 2014, Bułaj et al. 2017 – P). A 10-year period is sufficient for the formation of fully-stocked and high (up to 2 m) self-sown black cherry (Adamczak 2007 – P), which impedes possible agrotechnical treatments to restore fellows and uncultivated lands for agricultural purpose. In accordance with *Harmonia*$^{+PL}$ protocol, the likelihood of negative impact of black cherry is assessed as high because it can refer to more than 2/3 of forest areas prone to invasion of this species. The consequence is assessed as medium, which in result means high impact of the species on plant crops, particularly forests.

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

	very low
	low
X	medium
	high
	very high

aconf19.	Answer provided with a	low	medium **X**	high	level of confidence

acomm23.	Comments: Leaves of black cherry show symptoms of disease caused by microfungi *Monilinia linhartiana* Sacco (Ruszkiewicz-Michalska and Mułenko 2003 – P) and *Taphrina deformans* (Berk.) Tul. (Halarewicz and Mazurek 2017 – A), which suggests that this species is a vector for two common diseases of orchard crops, brown rot of stone fruit-bearing trees, and peach leaf curl. Among 42 species of macrofungi observed on wood of black cherry, *Chondrostereum purpureum* is the most frequent. This fungus is a saprophote, which also lives as a parasite, infects live trees, e.g. fruit and wild trees, causing bark necrosis and silver leaf (Marciszewska et al. 2018 – P). Black cherry, like e.g. birch and poplar, on which *Ch. purpureum* occurs, may be a source of infection for cultivated species of trees and shrubs, particularly plum, cherry, peach and nectarine which are very prone to this disease (Rebandel 1993 – P). Cherry weevil *Furcipes retirostris* L. feeds and reproduce on *P. serotina*. It is a serious pest for cherry and wild cherry trees (Sądej et al. 2003, Pairon et al. 2006, Halarewicz 2016, Vanhellemont et al. 2014 – P), and *Drozophila suzukii* Matsumara – a species of true flies

included on the list A2 EPPO (EPPO 2018 – B), living on plants of *Prunus* genus. The consequence of stone fruits damage caused by*D. suzukii* is premature fruit drop (Poyet et al. 2014, Halarewicz 2016 – P).

Among wood insects feeding on leaves of black cherry, *Gonioctena quinquepunctata* Fabr. appears abundantly and is harmful. It is also present on different types of understory species, such as *Prunus padus*, *Sorbus aucuparia*, *Alnus* sp., *Salix* sp. (Halarewicz and Jackowski 2011, Mąderek et al. 2015 – P), and bird-cherry ermine *Yponomeuta evonymellus* L., so far monophage *P. padus* (Łukowski et al. 2017 – P).

According to observations made by Hille Ris Lambers (1971 – P), black cherry was assumed to be a new host to bird cherry-oat aphid *Rhopalosiphum padi* (L.) and cause an increased harmfulness to cereal crops. The current research works on *P. serotina* in Poland only confirm that aphids lay overwintering eggs from which a new generation of aphids will not be born in spring (Halarewicz and Gabryś 2012 – P).

In accordance with *Harmonia*$^{+PL}$ protocol, at least one reported species from the EPPO A2 list cause that the species impact on plant crops is assessed as medium.

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:

X	inapplicable
	very low
	low
	medium
	high
	very high

aconf20.	Answer provided with a	low	medium	high	level of confidence

acomm24. Comments:

This species is a plant, thus this indicator is not taken into account while assessing the species impact on animal production.

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

X	very low
	low
	medium
	high
	very high

aconf21.	Answer provided with a	low	medium **X**	high	level of confidence

acomm25. Comments:

Leaves, branches, bark and seeds of black cherry contain cyanogenic glycosides: prunasin and amygdalin (Cheeke and Schull 1985 – P as cited in CBIF 2018 – B, Santamour 1998, Marquis 1990 – P). When plant tissues are damaged, these compounds are hydrolysed to toxic hydrogen cyanide HCN (CBIF 2018 – B). In America, forage containing *P. serotina* is well tolerated by deer, but can cause disease or death of domestic cattle (Marquis 1990 – P). In Europe, no data is published on reported cases of poisoning domestic animals after the

consumption of black cherry. In Denmark and the Netherlands, cows, sheep, and goats are used to eliminate seedlings and young sprouts of *P. serotina* under the program of species control (Vanhellemont 2009 – P). Biting by deer was suggested as a possible control over black cherry in Belgium (Muys et al. 1992 – P).

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

X	inapplicable
	very low
	low
	medium
	high
	very high

aconf22.	Answer provided with a	low	medium	high	level of confidence

acomm26. Comments:

This species is a plant which does not carry pathogenes or animal 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:

X	inapplicable
	very low
	low
	medium
	high
	vert high

aconf23.	Answer provided with a	low	medium	high	level of confidence

acomm27. Comments:

This species is a plant, thus this indicator is not taken into account while assessing the species impact on human targets.

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

X	very low
	low
	medium
	high
	very high

aconf24.	Answer provided with a	low	medium **X**	high	level of confidence

acomm28. Comments:

No data on the species impact on this domain. Black cherry pollen is not on the list of common inhalants (Odetchnij spokojnie *[Breathe normally]* 2018 – I). Food allergens include fruits of some species related to *P. serotina* – anus apricot *Armeniaca vulgaris*, wild cherry

Cerasus avium, peach *Persica vulgaris*, and *Prunus domestica* (Bokszczanin and Przybyła 2011 – P). By analogy to *Cerasus avium*, allergic reactions experienced by few representative of the population caused by fruits of black cherry cannot be excluded (Scheurer et al. 1997 – P).

Leaves, branches, bark and seeds of black cherry contain cyanogenic glycosides: prunasin and amygdalin (Cheeke and Schull 1985 – P as cited in CBIF 2018 – B, Santamour 1998, Marquis 1990 – P). When plant tissues are damaged, these compounds are hydrolysed to toxic hydrogen cyanide HCN (CBIF 2018 – B). Cases of poisoning, and even death in children were reported in America after consuming a large quantity of stone fruits. Children can be also poisoned through chewing twigs or drinking tea made of black cherry leaves (Hardin and Arena 1969 – P as cited in CBIF 2018 – B). Cases of poisoning by consuming parts of this species have not been reported in Europe.

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

X	inapplicable
	very low
	low
	medium
	high
	very high

aconf25.	Answer provided with a	low	medium	high	level of confidence

acomm29. Comments:

This species is a plant, thus this indicator is not taken into account while assessing the species impact on human targets.

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
X	medium
	high
	very high

aconf26.	Answer provided with a	low	medium **X**	high	level of confidence

acomm30. Comments:

The impact of the species on infrastructure includes the following area:

- construction plots – black cherry appears in adjacent areas, it is a promoter of wood succession on uncultivated lands (inter alia. Pabjanek 2003 – N, Adamczak 2007 – P), which can be used for houses in the future. Elimination of black cherry will require a lot of effort and money, as in case of measures implemented to woods. Such situations were observed in the Kampinos National Park protection zone (Otręba 2017b – A).
- high voltage lines – black cherry often grows under voltage lines as it is a zoochore, that is, it is dispersed by birds using poles like resting places (Kurek et al. 2015 – P) and due to easy availability of light (Otręba 2012 – N). Regular removal is connected with costs covered by an administrator of power lines.
- forest road – in forest communities where black cherry is abundant, it intensively grows along roads (Halarewicz and Bączek 2016 – P), which is caused by better light access in

	these places (inter alia, Chmura 2004 – P). Maintaining suitability for driving, including fire escapes, requires additional costs (Otręba 2016 – A).

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
X	moderately negative
	neutral
	moderately positive
	significantly positive

aconf27.	Answer provided with a	low	medium **X**	high	level of confidence

acomm31. Comments:

Black cherry within the introduced range has not met expectations to be a production species (inter alia, Tumiłowicz 1977, Muys et al. 1992, Starfinger et al. 2003 – P). Within its natural range of occurrence in Allegheny Plateau, North America, black cherry at the age of 50-80 years reaches log height, and its timber is used for producing furniture and veneers. High commercial value of black cherry material is caused by its strength properties, colour and ring pattern (Pacyniak and Surmiński 1976, Marquis 1990, Kozakiewicz 2010 – P). This species grows quickly in Europe, but its growth habit is irregular, particularly in case of poor soils (Starfinger et al. 2003 – P). Black cherry provides poor-quality wood with parameters similar to wood of bird cherry *Padus avium* or silver birch *Betula pendula* (Pacyniak and Surmiński 1976 – P), which is used as fuel (smallwood and productive wood from thinning), and in some parts of Poland, it used to make logs. No information has been published about quantities of obtained wood of black cherry in Poland. However, the negative impact of the species on regeneration of native tress (see a18) seems to cause greater losses than profits obtained from wood of *P. serotina*.

The beneficial effect of the species on ecosystem services is connected with finding food. Up to 50 kg of fruits can be obtained from one tree (Sądej et al. 2003, Łuczaj 2011 – P). Fruits of a typical variety were appreciated and often consumed raw or dried by Indians from North America (Marquis 1990, Łuczaj 2004 – P). Nowadays, stone fruits are used in domestic processing for producing juices, jellies, liqueurs and in herbal medicine. This species has medicinal properties as it contains cyanogenic glycosides (see a28). Infusion of black cherry bark can be used as an antitussive, strengthening and sedative product (Marquis 1990 – P). Moreover, black cherry is a melliferous plant producing on average 15 kg of sugars and 22 kg of pollen from 1 ha (Kotłowski 2005, Lipiński 2010 – P).

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

	significantly negative
X	moderately negative
	neutral
	moderately positive
	significantly positive

aconf28.	Answer provided with a	low	medium **X**	high	level of confidence

acomm32.	Comments:

Black cherry was planted to, inter alia, improve soil properties in coniferous stands (inter alia, Muys et al. 1992, Starfinger 1997, Szwagrzyk 2000 – P). A range of studies confirms its positive effect regarding improved soil fertility (inter alia, Plichta et al. 1997, Dessonville et al. 2008, Halarewicz et al. 2017a – P). This species became widespread in Europe as it was used as a protection for coniferous plantings against fire and wind, for sand stabilisation, and afforestation of heathlands (Starfinger et al. 2003, Vanhellemont 2009 – P). At the same time, it was observed that *P. serotina* was forming under favourable conditions, thick and dense understory which limited regeneration of native species (inter alia, Rutkowski et al. 2002, Starfinger et al. 2003, Juhász 2008 – P) and adversely affected the covering and the number of herbaceous species (Starfinger 1997, Verheyen et al. 2007, Chabrerie et al. 2010, Halarewicz and Żołnierz 2014, Halarewicz and Pruchniewicz 2015 – P).

Black cherry is attacked by pathogenic fungi, it is also a host plant to herbivorous insects (see a16). This, its impact on controlling the population of pathogens and pests in biocenoses cannot be excluded. *P. serotina* is also likely to have an indirect effect on pollinating effectiveness of native species (Jabłoński 1998 – P). Furthermore, fruits of black cherry are an additional food source for birds and mammals (inter alia, Bartkowiak 1970, Marquis 1990, Deckers et al. 2005 – P, Kurek 2012 – N).

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

	significantly negative
	moderately negative
X	neutral
	moderately positive
	significantly positive

aconf29.	Answer provided with a	low	medium **X**	high	level of confidence

acomm33.	Comments:

No detailed information on this scope. Dense understory of black cherry modifies landscape values of forests. As a result, typical forests with poorly developed layer of shrubs start to disappear (inter alia, Starfinger et al. 2003, Halarewicz 2012a – P), which can be negatively perceived by people resting in wood. Moreover, intensive overgrowing of shoulders and clearings with *P. serotina* hinders tourism and recreation. On the other hand, beautiful autumn leaves and blooming flowers are very attractive (Bugała 1991 – P). Expansion of the species, although harmful to the environment, has a positive effect on science development. Ecology of invasion initiated by Elton (1967 – P) is a rapidly developing field of knowledge. Taking into account moderately negative impact on cultural services and moderately positive impact, the overall impact of the species on this domain is assessed as neutral.

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

Below, each of the Harmonia^{+PL} 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
X	not change
	increase moderately
	increase significantly

aconf30.	Answer provided with a	low	medium **X**	high	level of confidence

acomm34. Comments:

It is the established species (Tokarska-Guzik et al. 2012 – P), present throughout Poland (Zając A. and Zając M. 2001, Tokarska-Guzik 2005 – P). Further introduction of black cherry seems to have no relations to climate changes.

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
X	not change
	increase moderately
	increase significantly

aconf31.	Answer provided with a	low	medium **X**	high	level of confidence

acomm35. Comments:

Black cherry is the established species (Tokarska-Guzik et al. 2012 – P). Its population is large on a considerable area of Poland, and individual stands are observed in the mountains and the north-eastern Poland (Zając A. and Zając M. 2001, Tokarska-Guzik 2005 – P). Such a distribution model of the species probably results from sites of its introduction, rather than climate restrictions – too low temperatures. Black cherry can resist frost and freeze. It belongs to species growing in the climate with the average minimum temperature from -35^{o}C to -20^{o}C (Hereźniak 1992 – P). *Padus serotina* expands in West Europe (Belgium, the Netherlands), and in northern Italy or France where the average temperature is higher than in Poland (Vanhellemont 2009 – P, CABI 2017 – B). A wide amplitude of ecological requirements of this species, known for its natural range (Marquis 1990 – P) indicates that climate changes do not affect its survival and reproduction in Poland.

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
X	increase moderately
	increase significantly

aconf32.	Answer provided with a	low	medium **X**	high	level of confidence

acomm36. Comments:

Like in case of its establishment, a wide amplitude of ecological requirements of this species, known for its natural and introduced range (inter alia, Marquis 1990, Starfinger 1997, Vanhellemont 2009 – P, CABI 2017 – B), can indicate that climate changes do not affect spreading of black cherry in Poland. Considering the impact of climate changes on forests in Poland, the following scenario is expected: displacement of coniferous species with deciduous species, forest dieback in some regions caused by overdrying, intensified gradation of insects, windblows (Kornatowska and Smogorzewska 2010, Czerepko et al.

2010 – P). Such circumstances may affect expansion potential of black cherry in two ways: positively or negatively. More favourable growing conditions for native deciduous species will limit the population of *P. serotina*, which is prone to competition and shade (inter alia, Rutkowski et al. 2002, Starfinger et al. 2003, Vanhellemont 2009 – P). Disturbances of large areas and related gaps will stimulate faster growth, earlier and more abundant fruiting of this species (inter alia, Starfinger 1997, Closset-Kopp et al. 2007, Halarewicz 2012a – P).

And studies on the presence of *P. serotina* under conditions of an urban heat island show that temperature has an impact on the species spreading. The majority of seeds is self-sown in areas at a temperature >10^{o}C (this value refers to a difference in temperature between the urban and suburban areas), and the smallest number of self-seeding is observed in the zone of urban cold island (<7^{o}C) (Bąbelewski 2014 – P).

Seeds of *P. serotina* germinate if a long-term (190 days), wet autumn-winter stratification at a temperature (2-3^{o}C) occurs (Suszka 1967, Phartyal 2009 – P), and only a big and long-term increase in winter temperature can negatively affect rest of plant seeds.

Taking into account the growth and reduced spreading of this species caused by global warming, finally the option of moderate growth and spread is chosen.

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
X	not change
	increase moderately
	increase significantly

aconf33. Answer provided with a

low	medium	high
	X	

level of confidence

acomm37. Comments:

It is the established species (Tokarska-Guzik et al. 2012 – P), present throughout Poland in different sites (Zając A. and Zając M. 2001, Tokarska-Guzik 2005 – P, Zając A. and Zając M. 2015 – P). As global changes are favourable for some aspects, and for others limit the expansion of black cherry (comment a36), the species impact on the natural environment should not be changed.

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
X	not change
	increase moderately
	increase significantly

aconf34. Answer provided with a

low	medium	high
	X	

level of confidence

acomm38. Comments:

Global warming can cause disturbances of large areas of pine stands (Kornatowska and Smogorzewska 2010, Czerepko et al. 2010 – P), then black cherry can hinder regeneration of forests over larger area. On the other hand, more favourable growing conditions for native deciduous species will limit the population of *P. serotina*, which is prone to competition and shade (inter alia, Rutkowski et al. 2002, Starfinger et al. 2003, Vanhellemont 2009 – P). To sum it up, predicted climate changes will not change the impact of black cherry on forest economy (no direct data on the discussed issue).

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
X	not change
	increase moderately
	increase significantly

aconf35.	Answer provided with a	low	medium **X**	high	level of confidence

acomm39. Comments:

The current impact of the species on animal production is assessed as very low (see point a25). Assuming that climate changes cause a moderate increase in the species spread (see point a36), no changes in the species impact on animal production are expected (no direct data on the discussed issue).

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

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

aconf36.	Answer provided with a	low	medium **X**	high	level of confidence

acomm40. Comments:

The current impact of the species on human health is assessed as low (see point a28). Assuming that climate changes cause a moderate increase in the species spread (see point a36), no changes in the species impact on human targets are expected (no direct data on the discussed issue).

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

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

aconf37.	Answer provided with a	low	medium **X**	high	level of confidence

acomm41. Comments:

The current impact of the species on other facilities is assessed as medium (see point a30). Assuming that climate changes cause a moderate increase in the species spread (see point a36), no changes in the species impact on other facilities are expected (no direct data on the discussed issue).

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	1.00	1.00
Establishment (questions: a09-a10)	1.00	1.00
Spread (questions: a11-a12)	0.63	0.50
Environmental impact (questions: a13-a18)	0.75	0.60
Cultivated plants impact (questions: a19-a23)	0.45	0.60
Domesticated animals impact (questions: a24-a26)	0.00	0.50
Human impact (questions: a27-a29)	0.00	0.50
Other impact (questions: a30)	0.50	0.50
Invasion (questions: a06-a12)	0.88	0.83
Impact (questions: a13-a30)	0.75	0.54
Overall risk score	0.66	
Category of invasiveness	moderately 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:

According to the performed assessment, black cherry is considered as an alien invasive species with a negative impact. As an established plant which spread is ongoing and broadens its occurrence range, the high average assessment of modules concerning the invasion process (questions: a06-a12) has a weight of 0.88. The highest impact of the species is found on the module of the natural environment (questions a13-a18, weight: 0.75). The impact of *P. serotina* on cultivated plants (questions: a19-a23) has the weight of 0.45. The species has no negative impact on human targets (questions: a27-a29) and animal production (questions: a24-a26). The assessment was based on expertise and available data. Due to high invasive potential of black cherry, it is likely to have a greater impact, particularly in very distorted forest communities.

Data sources

1. Published results of scientific research (P)

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