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. Barbara Tokarska-Guzik
2. Dan Wołkowycki
3. Bogdan Jackowiak

acomm01. Comments:

	degree	affiliation	assessment date
(1)	prof. dr hab.	Faculty of Biology and Environmental Protection, University of Silesia in Katowice	18-03-2018
(2)	dr	Faculty of Forestry, Bialystok Univeristy of Technology	23-01-2018
(3)	prof. dr hab.	Department of Plant Taxonomy, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University in Poznań	20-03-2018

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

Polish name: Trojeść amerykańska

Latin name: ***Asclepias syriaca*** L.

English name: Common milkweed

Współfinansowano w ramach projektu nr POIS.02.04.00-00-0100/16 pn. *Opracowanie zasad kontroli i zwalczania inwazyjnych gatunków obcych wraz z przeprowadzeniem pilotażowych działań i edukacją społeczną* ze środków Unii Europejskiej w ramach Programu Infrastruktura i Środowisko 2014-2020

acomm02. Comments:

Asclepias is a widespread genus of 76 species (CABI 2018 – B). *Asclepias syriaca* is one the most widely distributed species, locally present in large populations (Hartzler and Buhler 2000 – P). The preferred scientific and common names provided follow The Plant List (2013 – B), Flowering plants and pteridophytes of Poland. A checklist (Mirek et al. 2002 – P) and CABI (2018 – B). In addition, there are other synonyms provided: *Asclepias kansana* Vail, *A. syriaca* var. *exaltata* (L.) L., *A. syriaca* f. *inermis* J.R.Churchill, *A. syriaca* L. var. *kansana* (Vail) Palmer & Steyermark, *A. syriaca* f. *leucantha* Dore, *A. syriaca* f. *polyphylla* B.Boivin, *A. syriaca* f. syriaca, *A. syriaca* var. *syriaca*, and in older literature also *A. cornuti Decne* (The Plant List 2012, CABI 2018, USDA NRCS 2018 – B). There are also other numerous synonyms of the English name: blood flower, butterfly flower, common milkweed, cotton weed, silkweed, silky swallow-wort, Virginia silkweed, wild cotton (Bagi 2008 – P, CABI 2018 – B).

Polish name (synonym I)	Polish name (synonym II)
–	–
Latin name (synonym I)	Latin name (synonym II)
Asclepias grandifolia	*Asclepias illinoensis*
English name (synonym I)	English name (synonym II)
Broadleaf milkweed	Butterfly flower

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:

Asclepias syriaca (common milkweed) is a species originating from North America (Hartzler and Buhler 2000 – P), observed in the current territory of Poland since the 19th century (Rostafiński 1872 – P, Abromeit et al. 1898–1940 – P). This species has the status of an established kenophyte in Poland (Tokarska-Guzik 2005 – P). It is one of the invasive plants threatening native species or natural habitats (Ordinance of the Minister of the Environment 2011 – I) or species demonstrating invasive properties in countries neighbouring Poland, potentially invasive in the country, the spread of which will be supported by forecasted climate changes (Tokarska-Guzik et al. 2012 – P). The species occurs on dispersed positions in the lower altitude parts of Poland, e.g. in the Gdańsk Lakeland, Toruń, the Lublin Upland, the Małopolska Upland, the Kraków-Częstochowa Upland, the North Podlasie Lowland and the Lithuanian Lakeland (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P, Wołkowycki 1998-2015 – A). Over the last few years there have been reports of the appearance of the species in new localities (Puchałka et al. 2013 – P, Podlaska 2014 – N, Zając and Zając 2015 – 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
	the other domains

acomm05. Comments:

As the result of its abundant presence, common milkweed threatens native species diversity, penetrating into the natural and semi-natural habitats present, for example, in river valleys (Botta-Dukát 2008 – P). Thanks to the features of its biology, its impressive size, its ability to quickly grow vegetatively and form extensive stands (Bhowmik 1994 – P), common milkweed is able to significantly change the species composition and structure of plant communities and ecosystems into which it penetrates. It is one of the invasive species that threaten some Natura 2000 natural habitats, i.e. pannonic sand steppes (type 6260), present mainly in Hungary (Šefferová and Stanová 2008 – I). Competition with other plants occurs both by the direct route (competition for space), shading lower layers of the undergrowth, competing for soil resources and water, as well as by the litter formed by the fall of its large, leathery leaves which may impede germination of other plants. Milkweed is a species that produces large amounts of nectar, which is very attractive for many pollinators, including bees. Because of that, it is often grown by beekeepers. Interactions with pollinating insects and indirectly with other plants are complex and require in-depth studies. The trap-flowers of milkweed cause increased mortality of small insects, especially dipterans. There are potential possibilities of competition for pollinators with other plant species, and effects on insect groups. Through effective competition for pollinators, milkweed results in, for example, decrease in sunflower yield (Bagi 2008 – P). The species is present as a weed in cereal crops (Puchałka et al. 2013 – P) and thus can significantly reduce crop yields. The plant contains glycosides which can be toxic to sheep, cattle, horses and poultry (Anderson 1999 – P), and in the raw condition – in large quantities – also to humans. Various parts of the plant are edible after heat treatment. Common milkweed also has many uses as a utility plant, e.g. it is fibre- and rubber-yielding. In addition, this species produces allergic and allelopathic effects (Konstantinović 2009 – P, Tokarska-Guzik et al. 2015 – I, CABI 2017 – 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:

Common milkweed has been recorded in 17 European countries, where it is, in most cases, considered to be established (Tokarska-Guzik et al. 2015, Tokarska-Guzik and Pisarczyk 2015 – I). The species is most widespread in the warmer regions of southern Europe, where it is classified as invasive (Konstantinovic et al. 2008, Jarić 2011 – P), including all the countries neighboring Poland, where it grows both spontaneously and as a crop: in the Czech Republic (Pyšek and in. 2012 – P), in Slovakia (Medvecká et al. 2012 – P), in Lithuania (Kuusk et al. 1996 – P), Belarus (Parfenov 1999 – P), and in Ukraine (Protopopova et al. 2006 – P, Shevera 2015 – N). The presence of the species is also confirmed in Germany (FloraWeb BfN – I) and Russia (Tokarska-Guzik and Pisarczyk 2015 - I, CABI 2018 – B). The

plant reproduces sexually, producing large amounts of seeds which spread with the wind (anemochorically) (Bhowmik 1982, Pleasant 1991 – P). As a clonal plant, it presents a large capacity for vegetative reproduction through rhizome growth and fragmentation (Anderson 1999, Nowiński and Latowski 2003, Podbielkowski and Sudnik-Wójcikowska 2003, Borders and Lee-Mäder 2014 – P), which is an important element to support its spread. The species is already present in the territory of Poland, yet in addition, due to its presence in countries neighboring Poland, it may occur in new places in the country through independent expansion (especially in near-border areas). The main method of spread in this case includes the numerous seeds, which possess a flight-supporting apparatus and can be transferred over relatively large distances with the wind (White 1996 – P). These possibilities can increase under extreme conditions (strong winds, whirlwinds, which have also been observed in Poland over recent years).

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:

The species is a field crop weed (e.g. in cereals, soy, maize, alfalfa), also vinyards are included in the European part of its secondary range; it is also present on post-agricultural wastelands (Valachovič 1987, Kojić et al. 2004, Stanković-Kalezić 2008 – P). Because of that, it is likely that its seeds or fragments of rhizomes will be introduced into transported agricultural products. However, there is no documented data confirming this possibility unambiguously. Common milkweed propagules (rhizomes and seeds) can be moved during construction and road works, along with soil, organic materials, animals, agricultural and construction machines, etc., both by road vehicles, as well as along railways. Such proliferation vectors are indicated by, for example, localities in the immediate vicinity of highways and on railway embankments (Puchałka et al. 2013 – P, Tokarska-Guzik and Pisarczyk 2015 – I).

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:

Asclepias syriaca is a plant species that, due to its properties and the possibilities of its use, both in the past and present, remains within the circle of human interest (Tokarska-Guzik and Pisarczyk 2015 – I). It was probably brought to Europe in the 18th century, as an ornamental plant, and then spread as a utility plant. At the moment, common milkweed is available commercially as a melliferous plant (known and promoted as the so-called "beekeeper gold"), sold by small companies and individuals, including over the Internet. Honey yield is assessed in Poland at approx. 600 kg/ha. Beekeeping crops are established from both rhizomes and by sowing. Plants can still be planted in gardens for decorative purposes (until recently recommended for natural gardens, displayed in groups, in order to lure butterflies). The plant can penetrate neighbouring habitats (wastelands, grasslands, forest edges) from the places of cultivation. Scientific research is also listed as a reason for *Asclepias syriaca* introduction (CABI 2017 – B). The inclusion of *Asclepias syriaca* in the Regulation of the Minister of the Environment of 9th September 2011, in the list of plants

and animals of alien species, which in case of release into the natural environment may threaten native species or natural habitats (Regulation 2011 – P), limits its intentional introduction only formally. Intentional introductions of the species as a melliferous plant do still occur (Wołkowycki 1998-2015 – A). The species is recommended for filling unoccupied spaces in storage areas and warehouses (Lipiński 2010 – P). The milkweed plantations are being put on post-agricultural lands, and near-forest wastelands (Wołkowycki 2014 – P). During World War II, the species was introduced into cultivation as a rubber-yielding plant, e.g. in Podlachia in eastern Poland. Wild plants from those wartime crops were still being reported at the end of the 20th century (Wołkowycki 2000 – 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	level of confidence
		X	

acomm09. Comments:

The natural range of *Asclepias syriaca* includes the central, northern and north-eastern regions of the United States of America (where it is present in forty states) and neighbouring areas of Canada (in six provinces) (CABI 2017 – B). The range is between 35-50° north latitude and 60-103° east longitude, including the wet and dry (cold and warm) zone of temperate forests (Bagi 2008 – P). In its homeland, *Asclepias syriaca* finds optimum conditions for growth in mid-summer, especially in July, with temperature amplitudes from 18°C in the northern part of the range up to 32°C in the southern part. Appropriate conditions provide plants with approx. 30% insolation and adequate rainfall levels in the summer months (although excessively high precipitation levels limit their development) (Tokarska-Guzik and Pisarczyk 2015 – I and the literature cited therein). Having considered that, a moderate climate with the mean temperature of the coldest month > 0°C and <18°C, and the mean temperature of the warmest one > 10°C (CABI 2017 – B) is indicated as being preferred by the species. The optimal growth temperature is 27°C; limited growth of young plants is observed at 15°C (Bhowmik 1994 – P).

In Poland, favourable climatic conditions for the development of this species prevail in almost entire country, as is confirmed by its current distribution (Tokarska-Guzik 2005 – P). The species is present scattered throughout Poland, including more severe climatic conditions that is in the Suwałki region (Wołkowycki 1998-2015 – A). This species prefers sunny situations and belongs to the group of thermophilic plants, so it can be observed especially in urban centres constituting specific "thermal islands" (Tokarska-Guzik et al. 2015 – I). Common milkweed is able to tolerate temperatures below 0°C when in the form of seeds and as underground rhizomes. Low winter temperatures are also necessary to terminate seed dormancy. Suboptimal thermal conditions can limit the effectiveness of sexual reproduction, germination of seedlings and vegetative growth. The similarity between the climate of Poland and the climate of parts of both the natural and the secondary range of the species is very high (except for the average temperature in January which at from 0 to -5°C is lower in Poland) and is developed in 94-100% of its range, meaning that climatic conditions in our country are optimal for the analyzed species.

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:

Common milkweed demonstrates favourable habitat conditions for all of Poland, as well as for the Foothills of the Carpathians (Tokarska-Guzik 2005, Zając and Zając 2015 – P). Common milkweed is characterized by its adaptation to a wide range of habitat conditions (CABI 2018 – B). However, it prefers light and dry soil, it can grow on both alkaline and acid soils (Q-BANK 2014 – B) and it tolerates salinity (up to 2.500 ppm level, Cramer and Burnide 1982 – P). The best conditions for *Asclepias syriaca* development are provided by sunny or slightly shaded positions. In its natural range it grows in prairies, alluvial meadows, agricultural areas (in fields, maize and soy crops, pastures, fallow land), but also in ruderal habitats, such as roadsides, railway and wasteland embankments (Bhowmik and Bandeen 1976, Baskin and Baskin 1977, Hartzler and Buhler 2000, Pleasants and Oberhauser 2013 – P, Tokarska-Guzik and Pisarczyk 2015 – I). Within the secondary range, common milkweed is present in both semi-natural habitats, e.g. river valleys and water reservoir edges, dunes, open forests, grasslands and even swamps, and (more often) in habitats changed by humans, such as road edges, railway areas, abandoned orchards, vineyards, crops and fallow fields, various types of wasteland, especially in sandy, sunny places (Valachovič 1987, Kojić et al. 2004, Stanković-Kalezić 2008, Petrova et al. 2013, Puchałka et al. 2013, Matthews et al. 2015 – P, CABI 2017 – B). In Poland, it has been recorded in cereal crops, on post-agricultural land, in ruderal communities, on roadsides and railway embankments (Bacieczko et al. 2013, Puchałka et al. 2013 – P, Wołkowycki 1998-2015 – A).

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
X	medium
	high
	very high

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

acomm11. Comments:

Asclepias syriaca reproduces both sexually and vegetatively. Self-sterile and entomophilous flowers are formed in groups of 10-120 in the form of apical umbellate inflorescences (Anderson 1999 – P, Tokarska-Guzik et al. 2015 – I). Seeds bear a cluster of long white hairs which function in wind dispersal (Tokarska-Guzik et al. 2015 – I). Vegetative reproduction is accomplished by the growth and fragmentation of underground rhizomes. New shoots grow from the buds of the adventitious roots in the spring, in April and in May.

Estimation (type C data). Common milkweed produces large amounts of fluffy seeds dispersed by the wind. The weight of 100 seeds is 42-73 mg. With average population density equal to 1-3 shoots/m^2 (i.e. up to 60,000 shoots/ha), each of which can form 4-6 capsules with 150-425 seeds each (an average of 1450 seeds/shoot), local populations can produce approx. 87 million seeds/ha. Most seeds fall about 10 days after the capsules open. The seeds form a durable soil bank. Seed survival and germination are, however, limited by a number of environmental and biocenotic factors (Bhowmik 1994, White 1996, Csontos et al. 2009 – P, CABI 2011, 2017 – I). The underground system consists of horizontal and vertical roots and rhizomes. In stabilized populations, the roots/rhizomes can penetrate the soil to a depth of 3.8 m (Anderson 1999 – P). The annual rhizome growth can reach up to 3 m (Bagi 2008 – P). A large clonal stand of *Asclepias syriaca* can comprise several thousand stems (Wilbur 1976 – P). Vegetative reproduction significantly supports sexual reproduction (Anderson 1999, Nowiński and Latowski 2003, Podbielkowski and Sudnik-Wójcikowska 2003, Borders and Lee-Mäder 2014, – P). The current distribution and spatial structure of the population indicate that expansion develops thanks to the "phalanx" strategy, that is the gradual increase in the area of patches and the acreage of local populations acting with "dense front", mainly through the aggregation of vegetative growth, initiated by plants intentionally or unintentionally introduced into the environment by humans (Wołkowycki 1998-2015 – A). As in the case of other invasive species, one should take into account a violent, explosive population growth, leading to a change in the spatial pattern, after a certain compaction threshold is exceeded. This is favoured by the biological properties of the species as well as by its habitat preferences.

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

	low
X	medium
	high

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

acomm12. Comments:

The main, initial sources of expansion centres in Poland include plants deliberately introduced for cultivation, in particular for apiculture purposes, and then spreading mainly via the vegetative route. Residues of crops and wild plants may persist for over 50 years (Wołkowycki 2000 – P; Wołkowycki 1998-2015 – A), in some cases without significantly increasing the local area of the species. The rate of expansion was negligible, given the long history of cultivation and the current spread in the country. The first dates concerning the occurrence of the species in Poland come from the second half of the 19th century (Sapalski 1862 in Rostafiński 1872, Abromeit et al. 1898–1940 – P cf. Tokarska-Guzik 2005 – P), but a significant increase in the number of sites has only occurred in the last 20-30 years (Puchałka et al. 2013 – P), now exceeding 100 in number throughout the country. However, one should expect a sudden, explosive population growth after exceeding a certain compaction threshold. *Asclepias syriaca* was included in the Regulation of the Minister of the Environment of 9 September 2011 in the list of plants and animals of alien species, which in case of release to the natural environment may threaten native species or natural habitats (Regulation 2011– P). This should limit its intentional introduction for cultivation. However, given the decorative and utilitarian values of the plant, it cannot be assumed that beekeepers will completely cease sowing the species, for whom it is an important melliferous plant or that its introduction into home gardens will cease. Common milkweed can be also introduced unintentionally both in the form of seeds and fragments of rhizomes along with vegetable waste from gardens and with soil during various agricultural and construction works. It should be noted that even small fragments of rhizomes may develop into a new plant (CABI 2017 – B). Online sales can still play an important role in the spread of the species over long distances, despite the introduction of legal regulations in some countries (Lenda et al. 2014 – P).

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:

The species is a non-parasitic plant, it does not cause such interactions.

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

	low
	medium
X	high

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

acomm14. Comments:

Thanks to the features of its biology, its impressive size, its ability to quickly grow vegetatively and form extensive stands (Bhowmik 1994 – P), common milkweed is able to significantly change the species composition and structure of plant communities and ecosystems into which it penetrates. Competition with other plants occurs both by the direct route (competition for space), shading of the lower layers of the undergrowth, competition for soil resources and water, as well as litter fall made up of large, leathery leaves that may impede germination of other plants.

As a consequence of its massive presence, common milkweed threatens native species diversity, penetrating into natural and semi-natural habitats present, e.g. in river valleys (Botta-Dukát 2008 – P). The species is classified as an invasive species threatening some Natura 2000 natural habitats, i.e. pannonic sand steppes (code 6260) present mainly in Hungary (Šefferová and Stanová 2008 – I) or fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) and dunes with *Hippophae rhamnoides* (2160), which are colonized by the species in the Netherlands (Matthews et al. 2015 – P). The plant successfully reproduces sexually and vegetatively. Under favourable conditions, the seeds are characterized by high (90%) germination ability and they remain viable for up to 5 years. As soon as three weeks after germination, the young plants are able to spread further through the formation of shoots from buds on the rhizome (Bagi 2008 – P). Quite intensive individual and population growth in the occupied areas as a result of the formation of the system of underground rhizomes allows the species to compete with species of native plants in terms of space, light and food resources. In stabilized populations of *A. syriaca*, plant rhizomes can penetrate the soil to a depth of 3.8 m (Anderson 1999 – P). Large

populations can amount to several thousand shoots (Wilbur 1976 – P). In addition, this species has an allelopathic effect (Konstantinović et al. 2009 – P, CABI 2017 – B) which can limit the germination and growth of other plant species. Numerous flowers with a long flowering period (from June to August, depending on local conditions) produce significant amounts of nectar (Wyatt and Broyles 1994, Anderson 1999 – P). Flowers of this species produce nectar both day and night, hence the group of their pollinators is numerous. This feature may result in the avoidance and weaker pollination of native species by insects (Tokarska-Guzik 2016-2017 – A). In Hungary, the main pollinator includes *Apis mellifera* the honey bee, but also other species from this insect group; in addition, bumblebees (*Bombus*, e.g. *B. vagans* and *B. terricola*) are of great importance in pollinating common milkweed flowers. Within the secondary range, other groups of pollinators are probably less important – such as moths and butterflies or flies and beetles which are common pollinators in North America (Bagi 2008 – P).

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

X	no / very low
	low
	medium
	high
	very high

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

acomm15. Comments:

The *Asclepias* genus has about 140 species, present from the tropical to the temperate climate zone. These species almost never interbreed in nature, it is also difficult to cross plants artificially (Bagi 2008 – P). Only Moore (1946 – P) reported finding plants that could be hybrids growing in experimental plots of *A. syriaca* and *A. speciosa* plants. As there are practically no other "wild" species of this type in Europe (except for *A. curassavica* - established locally in Spain), the creation of hybrids is very unlikely. There are no native species in the national flora, phylogenetically close to *A. syriaca*, with which this species could interbreed.

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

	very low
X	low
	medium
	high
	very high

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

acomm16. Comments:

Within the natural range, many groups of organisms associated with *Asclepias syriaca* have been identified including insects, fungi, bacteria and viruses (Bhowmik and Bandeen 1976 – P, CABI 2017 – B). Among the species of herbivorous animals associated with *A. syriaca* in eastern North America, about 12 are mentioned most often, mostly specialized ones with nutrition adapted to the biological characteristics of the host (e.g. those related to the production of milky juice) (Van Zandt and Agrawal 2004 – P). *Asclepias syriaca* is host to insects, bacteria, fungi and viruses attacking crop plants (cf. a23). The effect on native species is limited and small.

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

X	low
	medium
	high

aconf13.	Answer provided with a	low	medium **X**	high	level of confidence

acomm17. Comments:

There are no data on significant modifications of abiotic habitat properties by common milkweed. Just like other clonal plants, capable of creating compact stands, the species can effectively absorb and move biogens and microelements from the soil solution, limiting their availability to other plants. The properties of the upper soil profile layers (wetness, aeration, fertility) can be modified as a result of litter formation, derived from its large leathery leaves.

Asclepias syriaca is a species associated primarily with disturbed habitats, therefore its possible effect on the integrity of the ecosystem by interfering with its abiotic characteristics is rather limited. A comparison of sandy turf soils with the involvement of *A. syriaca* with grasslands not occupied by populations of the species demonstrate that the latter were characterized by a slightly higher share of organic matter and nutrients (phosphorus and nitrogen) (Bagi 2008 – P). Common milkweed, through its intense vegetative growth, may produce deterioration in light conditions, especially for those herbaceous native species of smaller size.

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

	low
X	medium
	high

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

acomm18. Comments:

In areas of mass presence, common milkweed may cause a decline in biodiversity, in particular a decrease in the number of some plant populations and changes in the species composition and structure of some plant communities, culminating in their complete disappearance. However, this applies to a small group of species dispersed, in small populations, in the so-called "marginal habitats", in particular those related to semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (type 6210) and other habitats present on wastelands in the agricultural landscape (Bagi 2008, Kelemen et al. 2016 – P). The effect of *Asclepias syriaca* on the natural habitats of Nature 2000 has been so far documented in the cases of pannonic sand steppes (code 6260) present mainly in Hungary (Šefferová and Stanová 2008 – I), fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) and dunes with *Hippophae rhamnoides* (2160), which are colonized by the species in the Netherlands (Matthews et al. 2015 – P). The negative physical effect of the species is associated with shading and space occupation. Over the course of a year, the underground rhizomes of this plant may grow up to 3 m in length (Bagi 2008 – P).

In the initial phase of population development, milkweed does not show strong competitive abilities and can be effectively limited by other plant species, especially some grass species (Bhowmik 1994 – P). The species may limit the number of other plants, such as *Avena fatua* common wild oat, through allelopathic interactions, which may cause changes in the species structure of plant communities (Bhowmik 1994 – P). Observations conducted indicate that in many sites the species can persist in these initial stages for many years (Bagi 2008 – P), so the changes may be irreversible (however, this issue requires detailed research). Nevertheless, since the species primarily colonizes disturbed habitats, its effect with a mass presence) may be primarily caused by difficult to reverse changes (of processes occurring in

habitats that do not belong to habitats requiring special care, with less probability of changes associated with the disturbances of processes concerning habitats requiring special care.

Asclepias syriaca is an important source of nectar for many species of insects which may cause changes in local trophic networks, processes of pollination and dispersal of native species. Common milkweed stands, due to intensive production of nectar and very high attractiveness for numerous species of pollinators, have complex effects on insect groups and – indirectly – on populations of other plants, including their reproductive success. These effects can have different results causing: a) increased mortality of small insects, dying in milkweed trap-flowers, b) increased food supply, which may affect the increased survivability and increase in the population of some pollinators, and thus c) indirect beneficial effect on the number of insects visiting other plants, but also d) indirect negative effect on the chance of pollination and seed formation in other plants, both wild and cultivated (CABI 2011 – B). Within the natural range of *A. syriaca,* the life cycle of *Danaus plexippus* the migratory butterfly of the *Nymphalidae* family called the wanderer, the monarch or the monarch butterfly takes place. It is assumed that the decrease in the population size of this charismatic butterfly species may be related to the dissemination of techniques of intensive agriculture, excluding the possibility of milkweed growth.

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:

The species is a plant, also it has no parasitic properties.

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

	inapplicable
	very low
X	low
	medium
	high
	very high

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

acomm20. Comments:

Common milkweed is not a species competing effectively with cereals, root crops and other crops (Bhowmik 1994 – P). However, it can limit yields by both competition for resources

and allelopathic effects. *Asclepas syriaca*, both in its natural and secondary range, is considered to be a crop weed (Bagi 2008 – P, CABI 2017 – B). The crops affected by the species include soybean, cereals, peanuts and sorghum (Anderson 1999 – P), maize (Konstantinović et al. 2008 – P) and alfalfa (CABI 2017 – B). Results of the studies on competition between common milkweed and oat crops indicate losses in grain production of up to 20% (Bhowmik 1982 – P). A relationship between losses recorded in *Sorghum* cultivation and increases in the population of *A. syriaca* has been confirmed (NAPPO 2003 – I). Reports on the effect of common milkweed on crops within the secondary range come from Hungary (Bagi 2008 – P). Negative effects on arable land, vineyards and young forest plantations have been indicated. There is no data concerning the adverse impact of the species on the productivity of grasslands.

Milkweed causes a decrease in sunflower yield (Bagi 2008 – P), and probably also in other crops, through effective competition for pollinators. Paratrophic relationships with insect groupings may also have positive effects on agriculture, horticulture and gardening, resulting in increased pollinator survival and their more numerous presence in agricultural areas.

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

	inapplicable
X	no / very low
	low
	medium
	high
	very high

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

acomm21. Comments:

In cultivation on the territory of Poland, there are no plants that are phylogenetically close to *Asclepias syriaca*, with which this species could cross.

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

	very low
X	low
	medium
	high
	very high

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

acomm22. Comments:

On arable lands and within grasslands maintained in agricultural production, the species is usually unable to form large populations sufficient to significantly disturb the integrity of the crops. In cases of mass entry into arable fields and grassland, *Asclepias syriaca* may cause suppression and disappearance of some plant species. In terms of the secondary range of the species, such data originate from Hungary (Bagi 2008 – P). The extract from common milkweed roots has limiting effect on most cereal species (Bagi 2008 – P). The effect on trophic networks is indicated by competition with arable crops for pollinators (mainly with sunflower). In the existing Polish literature, there is no information on the effect of *A. syriaca* on the integrity of crops. The spread of the species on a larger scale could lead to disturbances in at least some crops – cereals, maize or alfalfa, although it is difficult to estimate the scale of the effect on the basis of existing data.

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:

Asclepias syriaca is a host for insects, bacteria, fungi and viruses attacking crop plants. Many aphid species develop on plants of the species, including *Aphis nerii* (Bagi 2008 – P, CABI 2017 – B), an insect feeding on plant species from the *Apocynaceae* family, for example on the flower buds of *Nerium oleander*. Many species of fungi grow on common milkweed, causing plant diseases such as *Uromyces asclepiadis* Cke rust, *Puccinia bartholomaei*, *Erysiphe cichoracearum* mold, *Botrytis hypophylla* gray mold and others. There are data on the presence of parasitic fungal species on *A. syriaca* (*Cadophora* sp. - parasites of, among others, apple, pear and vines; *Macrophomina phaseolina* - infecting many plant species; Day et al. 2016 – P) and viruses (tobacco mosaic virus (TMV), tomato spotted wilt virus (TSWV), alfalfa mosaic virus (AMV), cucumber mosaic virus (CMV), *Arabis* mosaic virus (ArMV); (Kazinczi et al. 2009 – P), all of these dangerous for arable crops. Due to the general prevalence of these pathogens in the environment, common milkweed populations do not seem to pose an additional threat in these terms.

There is a danger that common milkweed may be a vector for microorganisms that can accumulate in nectar (Bagi 2008 – P). *Asclepias syriaca* is also the host of *Frankliniella occidentalis* western flower thrips (Bagi 2008 – P), which originally inhabited the western part of North America. It has now been spread almost all over the world, carried on cut flowers and together with potted plants (Kirk and Terry 2003 – P). It is a polyphagous insect that does not show preference in its selection of plants and is classified as a most important crop pest – both on fruit trees and vegetables (CABI 2017 – B). The western flower thrips is a thermophilic insect, which is why in Europe, it can be found mainly in greenhouse crops. The insect inhabits the majority of species grown under cover in Poland. It was included in the A2 EPPO list as a quarantine species (Tommasini and Maini 1995 – P, CABI 2017 – B).

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:

The species is a plant and has no such interactions.

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
X	medium
	high
	very high

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

acomm25. Comments:

Asclepias syriaca produces a poisonous milky juice containing toxic glycosides causing poisoning in sheep and cattle, and occasionally also in horses (Anderson 1999 – P, CABI 2011). Information on the toxic effects of the plant on poultry is also available (White 1996 – P). Plants of the species are therefore a potential threat to livestock (effect = medium). However, animals may actively avoid chewing the plants (probability = low).

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:

Plants are not hosts or vectors of animal pathogens/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:

The species is not a parasitic plant.

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

	very low
X	low
	medium
	high
	very high

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

acomm28. Comments:

Asclepias syriaca is a medicinal plant used in traditional folk medicine, for example by Native Americans (Bhowmik and Bandeen 1976 – P). The plant contains poisonous glycosides, therefore it is a potential threat to humans if they consume large amounts of the plant in the raw state. However, after cooking, young shoots and fruits are eaten as a substitute for asparagus (Bagi 2008 – P). Some sources indicate that this species has allergic effects (Konstantinović et al. 2009 – P, CABI 2017 – B). Due to the possibility of the effect of the glycosides on heart function, the plant has been tested in this respect (Bagi 2008 – P).

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:

The species is a plant, it is not a vector of human parasites or pathogens.

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:

X	very low
	low
	medium
	high
	very high

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

acomm30. Comments:

The species does not affect any elements of terrestrial and underground infrastructure. In cases of an abundant occurrence of seed fluff, it can clog elements of the agricultural machinery working in the fields (CABI 2011 – B).

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
X	moderately positive
	significantly positive

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

acomm31. Comments:

Common milkweed has many utility applications. It was grown in Europe as a melliferous and fibre-yielding plant as well as a decorative plant (attractive flowers with a strong odour /perfume, appealing to insects). The shoot fibres were used to make paper. In addition, hairs from the seeds, which are waterproof, served as fill, e.g. in packaging, and fibre from shoots for making cords. During World War II, the seed hairs were also used to fill life jackets. The use of common milkweed as a food plant is also known (including boiled roots) and as medicine (folk medicine) (Q-BANK 2014, Tokarska-Guzik et al. 2015 – I, CABI 2017 – B). Common milkweed is a nectar-yielding plant the cultivation which has great importance for beekeeping. The honey yield is assessed in Poland at approx. 600 kg/ha (Lipiński 2010 – P). Due to the beneficial effects on insect groups (although negative interactions are also known), the presence of milkweed stands may favourably affect the pollination efficiency of various plants important to humans, both cultivated and wild. Recently, the potential for using this plant in various areas of life - "a multi-use plant species of the future", emphasizing the production of fibres, oil, rubber, and pharmaceuticals – has been stressed. The use the species as a potential source of biofuel, using both shoots and seeds, has also been considered. Currently, research is being carried out on its further cultivation (Roşu et al. 2011 – P). At the same time, *A. syriaca*, both in natural and secondary range, is also considered to be a crop weed, the massive spread of which leads to reduction in yields of up to 20% (see question a19). In Europe, yield losses (mainly in sunflower) are also associated with competition for pollinating insects (see question a22). *Asclepias syriaca* is the host for insects, bacteria, fungi and viruses that cause diseases of cultivated plants (cf. question a23), including being the host of *Frankliniella occidentalis* western flower thrips, one of the most important crop pests in fruit trees and vegetables, which was included on the EPPO A2 list as a quarantine species (cf. question a23). Plants of the species are also a potential threat to livestock, due to the secretion of a poisonous milky juice containing toxic glycosides (cf. question a25).

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

	significantly negative
	moderately negative
X	neutral
	moderately positive
	significantly positive

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

acomm32.	Comments:

The literature on the subject lacks information on the direct effect of the species on regulatory services. *Asclepias syriaca*, by changing biotic and abiotic conditions, may limit the development of plant species associated with semi-natural grassland communities (cf. questions A17 and A18). The species is a melliferous plant, and the flowers are extremely attractive to pollinators. The presence of milkweed stands can positively influence the pollination efficiency of various plants, both cultivated and wild, by beneficial effects on insect groups. However, there are also known negative effects associated with effective competition of this species for pollinators.

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

	significantly negative
	moderately negative
	neutral
X	moderately positive
	significantly positive

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

acomm33.	Comments:

Common milkweed is a plant still grown for its decorative qualities – attractive, fragrant flowers attract attention and attract many species of insects, including butterflies, the presence of which is perceived positively in human environments, and which additionally increases the aesthetic experience. Flavour (parts of the plant can be eaten) and medicinal qualities (the plant has long been known and used in herbal medicine, e.g. by native Americans) of the species can demonstrate its importance. Inflorescences and fruits are sometimes used in flower-arranging compositions - ikebanas (Bagi 2008 – P). The presence of small patches of the species may increase the aesthetic values of the agricultural landscape and have a positive effect on recreational functions.

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	high **X**	level of confidence

acomm34.	Comments: *Asclepias syriaca* is a species of foreign origin, established in Poland, which has already defeated geographical barriers and is spreading spontaneously (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). It is increasingly found in cultivation as an ornamental and melliferous plant. It escapes spontaneously from places of cultivation, it is also brought along communication routes. Moderate climate with the mean temperature of the coldest month >0°C and <18°C, and the mean temperature of the warmest one >10°C (CABI 2017 – B) is indicated as being preferred by the species. The assumed climate changes are therefore within the scope of its tolerance and will not produce major effects on its introduction.

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	high **X**	level of confidence

acomm35.	Comments: *Asclepias syriaca* is a species of foreign origin, established in Poland, which has already defeated geographical barriers and is spreading spontaneously (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). In Poland, common milkweed is found in dispersed positions in lowland parts, e.g. in the Gdańsk Lakeland, Toruń, the Lublin Upland, the Małopolska Upland, or the Krakow-Częstochowa Upland (Tokarska-Guzik et al. 2012, Puchałka et al. 2013 – P). Outlying populations are also known e.g. in the Suwałki area (Wołkowycki 1998–2015 – A, unpublished data from Wigry National Park) and the Brzeg Dolny region in Lower Silesia and Wrocław (Podlaska 2014 – N). It is increasingly found in cultivation as an ornamental and melliferous plant. It escapes spontaneously from places of cultivation, it is also brought along communication routes. A moderate climate with the mean temperature of the coldest month > 0°C and <18°C, and the mean temperature of the warmest one > 10°C (CABI 2017 – B) is indicated as being preferred by the species. The assumed climate changes are therefore within the scope of its tolerance.

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: The species is already established in Poland, has fairly numerous positions scattered throughout the country (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). It is also often grown in gardens (and even deliberately introduced outside them for the benefit of bees), despite its inclusion on the list of alien species, which in case of release to the natural environment may threaten native species or natural habitats (Regulation 2011 – P). It is still the subject of trade, also on the Internet (Tokarska-Guzik 2018 - A). The assumed climate changes are within its tolerance and will probably promote further spread. This species is a member of the thermophilic plants group, so it can be encouraged in urban centres

	constituting specific "thermal islands". In the case of climate warming, it can be predicted that it will spread around the places where it has already been recorded and occupy new places.

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
X	increase moderately
	increase significantly

aconf33.	Answer provided with a	low	medium **X**	high	level of confidence

acomm37.	Comments: Climate warming may result in further reproductive success of the species and population growth, as well as increasing its competitiveness, which in turn may lead to negative biocenotic changes and the disappearance of sensitive natural habitats (especially 6210-type grasslands) in the places where common milkweed is present. Forecasted climate changes may contribute to its further spread, including occupying new habitats present, for example, in river valleys. The denser and larger populations of *A. syriaca* may have a greater effect on native plant species (competition by occupying space and shading) and animals (competition for pollinators).

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
X	increase moderately
	increase significantly

aconf34.	Answer provided with a	low	medium **X**	high	level of confidence

acomm38.	Comments: Climate changes can affect paratrophic effects and the effects (both favourable and unfavourable) of common milkweed on insect groups pollinating crop plants. The effect of the species on crops, especially in case of its mass occurrence, has been rated as medium, mainly based on data from the natural range and other parts of the secondary range. Forecasted climate changes may contribute to its further spread in Poland, including the penetration of crops (e.g. maize or alfalfa). As a consequence, possible losses in yields should also be taken into account (including those due to competition for pollinating insects).

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: Common milkweed is an important plant grown for the needs of beekeeping, however, its cultivation has already been successfully established across the country. Other effects on animal breeding, related to the toxic properties of the plants, probably will not change with climate warming.

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 species' significant effect on human health has not yet been confirmed. *Asclepias syriaca* is a medicinal plant used in traditional folk medicine, e.g. by native Americans (Bhowmik and Bandeen 1976 – P). Although the plant contains poisonous glycosides, after cooking, young shoots and fruits (which are less toxic then) are eaten as a substitute for asparagus (Bagi 2008 – P). Some sources indicate that this species has allergic effects (Konstantinović et al. 2009 – P, CABI 2017 – B). Forecasted climate change will not change the effect of the species on humans; however, knowledge of possible effects should be supplemented.

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	high **X**	level of confidence

acomm41.	Comments: So far, there have been no reports on the effect of the species on infrastructure. This situation should not change with the forecasted climate changes.

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	1.00	1.00
Establishment (questions: a09-a10)	1.00	1.00
Spread (questions: a11-a12)	0.50	1.00
Environmental impact (questions: a13-a18)	0.35	0.80
Cultivated plants impact (questions: a19-a23)	0.20	0.60
Domesticated animals impact (questions: a24-a26)	0.50	0.50

Human impact (questions: a27-a29)	0.25	0.50
Other impact (questions: a30)	0.00	1.00
Invasion (questions: a06-a12)	0.83	1.00
Negative impact (questions: a13-a30)	0.50	0.68
Overall risk score	0.42	
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:

-

Data sources

1. Published results of scientific research (P)

Abromeit J., Neuhoff W., Steffen H., Jentzsch A., Vogel G. 1898–1940. Flora von Ost- und Westpreussen... p. 1248. Kommissionsverlag Gräfe und Unzer, Königsberg

Anderson WP. 1999. Perennial weeds. Characteristics and identification of selected herbaceous species. Iowa State University Press, Iowa, USA

Bacieczko W., Winiarska M., Baszutska U. 2013. *Asclepias syriaca* L. z rodziny Asclepiadaceae – ergazjofit we florze Polski. Naukovij visnik NLTU Ukraini 23: 52-58

Bagi I. 2008. Common milkweed (*Asclepias syriaca* L.). In: Z. Botta-Dukát and L. Balogh (eds.) The most important invasive plants in Hungary. ss. 151-159. Inst. of Ecology and Botany, Hungarian Academy of Sciences, Vácrátót, Hungary

Baskin JM, Baskin CC. 1977 Germination of common milkweed (*Asclepias syriaca* L.) seeds. – B. Torrey Bot. Club 104(2): 167-170.

Bhowmik PC. 1982. Herbicide control of common milkweed (*Asclepias syriaca*). Weed Science 30: 349-351.

Bhowmik PC. 1994. Biology And Control Of Common Milkweed (*Asclepias syriaca*). Rev. Weed Sci. 6: 227-250

Bhowmik PC, Bandeen JD. 1976. The biology of Canadian weeds. Can. J. Plant Sci. 56: 579–589.

Borders B, Lee-Mäder E. 2014 Milkweeds: A conservation Practitioner's Guide. The Xerces Society for Invertebrate Conservation. Portland, OR.

Botta-Dukát Z. 2008. Invasion of alien species to Hungarian (semi-)natural habitats. Acta Botanica Hungarica, 50 (Supplementum): 219-227. http://www.akademiai.com

Csontos P, Bózsing E, Cseresnyés I, Penksza K. 2009. Reproductive potential of the alien species *Asclepias syriaca* (*Asclepiadaceae*) in the rural landscape. Pol. J. Ecol. 57(2): 383–388.

Cramer GL, Burnside OC. 1982 Distribution and interference of common milkweed (*Asclepias syriaca*) in Nebraska. Weed. Sci. 30: 385–388

Day NJ, Dunfield KE, Antunes PM. 2016. Fungi from a non-native invasive plant increase its growth but have different growth effects on native plants. Biological Invasions 18: 231-243, doi:10.1007/s10530-015-1004-2

Hartzler RG, Buhler DD. 2000. Occurrence of common milkweed (*Asclepias syriaca*) in cropland and adjacent areas. Crop Protection 19(5): 363-366

Jarić S, Mitrović M, Vrbničanin S, Karadić B, Djurdjević L, Kostić O, Mačukanović-Jocić M, Gajić G, Pavlović P. 2011. A contribution to studies of the ruderal vegetation of southern Srem, Serbia. Arch. Biol. Sci. 63(4): 1181–1197

Kazinczi G, Horváth J, Takács A. 2009. Plant invaders as artificial and natural hosts of economically important viruses. pp. 479-482. Zbornik predavanj in referatov 9. Slovenskega Posvetovanja o Varstvu Rastlin. Nova Gorica, Slovenije

Kelemen A., Valkó O., Kröel-Dulay Gy., Deák B., Török P., Tóth K., Miglécz, T., Tóthmérész B. 2016 The invasion of common milkweed (*Asclepias syriaca* L.) in sandy old-fields – Is it a threat to the native flora? Applied Vegetation Science, doi: 10.1111/avsc.12225

Kirk DJ, Terry IL. 2003 The spread of the western flower thrips *Frankliniella occidentalis* (Pergande). Agricultural and Forest Entomology 5: 301-303

Kojić M, Stanković-Kalezić R, Radivojević Lj, Vrbničanin S. 2004. Contribution to the study of the ruderal vegetation of eastern Srem II, Acta Herbologica 13(1): 75-82

Konstantinović B, Meseldzija M, Mandic N. 2008. Distribution of *Asclepias syriaca* L. on the territory of Vojvodina and possibilities of its control. Herbologia 9(2): 39-46 http://www.anubih.ba/index.php?option=content&lang=eng&Theme=herbologia&Level=2&ItemID=7

Konstantinović B, Meseldžija M, Konstantinvić B, Mandić N, Korać M. 2009. Allergenic weed species and possibilities of their control. Biljni lekar. 37(6): 634–640

Kuusk V., Tabaka L., Jankevičiene R. (eds). 1996. Flora of the Baltic countries. 2: s. 372 Estonian Academy of Sciences, Institute of Zoology and Botany, Tartu

Lenda M, Skórka P, Knops JMH, Moroń D, Sutherland WJ, Kuszewska K, Woyciechowski M. 2014. Effect of the Internet Commerce on Dispersal Modes of Invasive Alien Species. PLoS ONE 9(6): e99786. https://doi.org/10.1371/journal.pone.0099786

Lipiński M. 2010. Pożytki pszczele zapylanie i miododajność roślin. PWRiL, Wydawnictwo Sądecki Bartnik

Matthews J, Beringen R, Huijbregts MAJ, van der Mheen HJ, Odé B, Trindade L, J.L.C.H. van Valkenburg JLCH, van der Velde G, Leuven RSEW. 2015. Horizon scanning and environmental risk analyses of non-native biomass crops in the Netherlands. Department of Environmental Science, Faculty of Science, Institute for Water and Wetland Research, Radboud University Nijmegen, Heyendaalseweg 135, 6525 AJ Nijmegen, The Netherlands

Medvecká J, Kliment J, Májeková J, Halada L, Zaliberová M, Gojdičová E, Feráková V, Jarolímek I. 2012. Inventory of the alien flora of Slovakia. Preslia 84: 257–309

Mirek Z., Piękoś-Mirkowa H., Zając A., Zając M. 2002 Flowering plants and pteridophytes of Poland. A checklist. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków

Moore RJ. 1946. Investigations on rubber-bearing plants. IV. Cytogenic studies in *Asclepias* (Tourn.) L. Can. J. Res. 24: 66-73

Nowiński M, Latowski K. 2003. Trojeść (*Asclepias*). In: A. Szweykowska, J. Szweykowski (eds). Słownik botaniczny. Państwowe Wydawnictwo „Wiedza Powszechna", Warszawa

Parfenov VI. 1999. Opredelitel' vysšich rastenij Belarusi. Izdatel'stvo "Dizajn PRO", Minsk

Petrova A, Vladimirov V, Georgiev V. 2013. Invasive alien species in Bulgaria. Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia

Pleasants JM. 1991. Evidence for short-distance dispersal of pollinia in *Asclepias syriaca* L. Functional Ecology 5(1):75-82.

Pleasants JM, Oberhauser KS. 2013. Milkweed loss in agricultural fields because of herbicide use: effect on the monarch butterfly population. Insect Conservation and Diversity 6: 135-144. doi: 10.1111/j.1752-4598.2012.00196.x

Podbielkowski Z, Sudnik-Wójcikowska B. 2003. Słownik roślin użytkowych. Państwowe Wydawnictwo Rolnicze i Leśne, Warszawa

Protopopova VV, Mosyakin SL, Shevera MV. 2002. Plant invasions in the Ukraine as a threat to biodiversity: The present situation and task for the future. 32 pp. M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Kyiv

Puchałka R., Rutkowski L., Piwczyński M. 2013. Trojeść amerykańska *Asclepias syriaca* L. w Toruniu i jego okolicach. Acta Bot. Cassub. 12: 5-23

Pyšek P, Danihelka J, Sádlo J, Chrtek J. Jr., Chytrý M, Jarošík V, Kaplan Z, Krahulec F, Moravcová L, Pergl J, Štajerová K,Tichý L. 2012. Catalogue of alien plants of the Czech Republic (2nd edition): checklist update, taxonomic diversity and invasion patterns. Preslia 84: 155–255

Regulation 2011. Regulation of the Minister of the Environment of 9 September 2011 on the list of plants and animals of alien species that could be a threat to native species or natural habitats in case of their release into the natural environment (Journal of Laws No 210, item 1260)

Rostafiński J. 1872. Florae Polonicae Prodromus. Verhandlungen d.k.k. zoologisch-botanischen Gesellschaft in Wien 22: 81–208.

Roşu A, Danaila-Guidea S, Dobrinoiu R, Toma F, Roşu DT, Sava N, Manolache C. 2011. *Asclepias syriaca* L. – an underexploited industrial crop for energy and chemical feedstock. Romanian Biotechnological Letters 16 (6): 131–138.

Stankovic-Kalezić R, Radivojević LJ, Jovanović V, Janjić V, Šantrić L. 2008. Adventivna vrsta *Asclepias syriaca* L. na podrucju Pancevackog Rita. Acta Herbologica 17(1): 95-103

Tokarska-Guzik B. 2005. The establishment and spread of alien plant species (kenophytes) in the flora of Poland. Wydawnictwo Uniwersytetu Śląskiego, Katowice

Tokarska-Guzik B, Dajdok Z, Zając M, Zając A, Urbisz A, Danielewicz W, Hołdyński Cz. 2012. Rośliny obcego pochodzenia w Polsce ze szczególnym uwzględnieniem gatunków inwazyjnych. Generalna Dyrekcja Ochrony Środowiska, Warszawa

Tommasini MG, Maini S. 1995. *Frankliniella occidentalis* and other thrips harmful to vegetable and ornamental crops in Europe. Wageningen Agricultural University Papers 95: 1-42

Valachovič M. 1987. K cenológii druhu *Asclepias syriaca* Na Záhorskej Nížine (Západné Slovensko). Zpr. Čs. Bot. Společ. 22: 59-60.

Van Zandt PA, Agrawal AA. 2004. Community-wide impacts of herbivore-induced plant responses in milkweed (*Asclepias syriaca*). Ecology 85(9): 2616-2629. http://www.esajournals.org/perlserv/?request=get-document&doi=10.1890%2F03-0622

White DJ. 1996. Status, distribution, and potential impact from noxious weed legislation. Report prepared for the Canadian Wildlife Service, Ottawa, Canada. Status, distribution, and potential impact from noxious weed legislation. Report prepared for the Canadian Wildlife Service, Ottawa, Canada http://www.monarchwatch.com/read/articles/canweed1.htm

Wilbur HM. 1976. Life history evolution in seven milkweeds of the genus *Asclepias*. Journal of Ecology 64(1): 223-240

Wołkowycki D. 2000. Różnicowanie się i ujednolicanie flor ruderalnych w warunkach izolacji środowiskowej. Monographiae Botanicae 87: 1–163.

Wołkowycki D. (ed.) 2014. Przyroda wsi Haćki na Równinie Bielskiej. Wyd. Fundacja Zielone Płuca Polski, Białystok

Wyatt R, Broyles SB. 1994. Ecology and evolution of reproduction in milkweeds. Annual Review of Ecological Systematics 25: 423-441.

Zając A, Zając M. 2015. Distribution of kenophytes in the Polish Carpathians and their Foreland. Institute of Botany, Jagiellonian University, Cracow

2. Databases (B)

CABI 2017. Datasheet *Frankliniella occidentalis* (western flower thrips) (https://www.cabi.org/isc/datasheet/24426)

Q-BANK 2014. Comprehensive databases on quarantine plants and diseases. Invasive plants. http://www.q-bank.eu/Plants/BioloMICS.aspx?Table=Plants%20-%20Species&Rec=59& Fields=All (accessed 06.04.2015).

The Plant List 2013. Version 1.1. Published on the Internet. *Asclepias syriaca* (http://www.theplantlist.org/tpl1.1/search?q=Asclepias+syriaca)

USDA NRCS 2018. Plants Database. Data Source and Documentation for *Asclepias syriaca* L. (https://plants.usda.gov/java/reference?symbol=ASSY)

3. Unpublished data (N)

Podlaska M. 2014. Details about *Asclepias syriaca* occurence in Lower Silesia. (the list of localities)

Shevera M. 2015. Information about occurence of *Asclepias syriaca* in the Ukraine, personal communication

4. Other (I)

FloraWeb BfN (http://www.floraweb.de/pflanzenarten/artenhome.xsql?suchnr=632&) Accessed: 2018-01-31

2000 USDA, NRCS. The PLANTS database (http://plants.usda.gov/plantguide/pdf/cs_assy.pdf)

CABI 2011. Commonwealth Agricultural Bureau International. *Asclepias syriaca* (common milkweed). (http://www.cabi.org/isc/datasheet/7249)

NAPPO 2003. Pest fact sheet *Asclepias syriaca* L. North American Plant Protection Organization (NAPPO). http://www.nappo.org/PRA-sheets/Asclepiassyriaca.pdf

Šefferová-Stanová V, Vajda Z, Janák M. 2008. Management of Natura 2000 habitats. 6260 *Pannonic sand steppes. European Commission.

http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/6260_Pannonic_sand_steppes.pdf (accessed 5.04.2015)

Tokarska-Guzik B, Bzdęga K, Nowak T, Urbisz A, Węgrzynek B, Dajdok Z. 2015. Propozycja listy roślin gatunków obcych, które mogą stanowić zagrożenie dla przyrody Polski i Unii Europejskiej. http://www.gdos.gov.pl/igo (accessed 8/12/2015).

Tokarska-Guzik B, Pisarczyk E. 2015. Risk Assessment of *Asclepias syriaca*.

5. Author's own data (A)

Tokarska-Guzik B. 2016-2017. Observation of population dynamics of *Asclepias syrica* in Rabsztyn.

Tokarska-Guzik B. 2018. Internet preliminary research concerning *Asclepias syrica* availability in the trade.

Wołkowycki D. 1998–2015. Observation and own details about *Asclepias syriaca* distribution in the Podlasie province.