

FORMAT FOR A PRA RECORD (version 3 of the Decision support scheme for PRA for quarantine pests)

European and Mediterranean Plant Protection Organisation		
Organisation Européenne et Méditerranéenne pour la Protection des Plantes		
Guidelines on Pest Risk Analysis		
Lignes directrices pour l'analyse du risque phytosanitaire		
Decision-support scheme for quarantine pests Version N°3		
PEST RISK ANALYSIS FOR <i>Heracleum sosnowskyi</i>		
Pest risk analyst:		
EPPO Secretariat		
Stage 1: Initiation		
1 What is the reason for performing the PRA?		<i>Heracleum sosnowskyi</i> is considered invasive in the EPPO region.
2 Enter the name of the pest		<i>Heracleum sosnowskyi</i>
2A Indicate the type of the pest		Plantae
2B Indicate the taxonomic position		Apiaceae
3 Clearly define the PRA area		EPPO member countries
4 Does a relevant earlier PRA exist?		No

5 Is the earlier PRA still entirely valid, or only partly valid (out of date, applied in different circumstances, for a similar but distinct pest, for another area with similar conditions)?		
Stage 2A: Pest Risk Assessment - Pest categorization		
6 Specify the host plant species (for pests directly affecting plants) or suitable habitats (for non parasitic plants) present in the PRA area.		Grasslands, forests, wetlands, riverbanks/canal sides, rail/roadsides, and urban areas.
7. Specify the pest distribution		EPPO region: Armenia (native), Azerbaidzhan, Russia (Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia, Ingushetia, Chechnya, Dagestan and possibly Black Sea coast), Belarus, Estonia, Germany, Hungary, Latvia, Lithuania, Poland, Russia (Central and Northern), Ukraine (introduced).
8. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	Yes	There have been confusions between <i>Heracleum mantegazzianum</i> , <i>H. sosnowskyi</i> and <i>H. persicum</i> , but recent genetical studies highlighted the fact that there are three distinct tall <i>Heracleum</i> species invading Europe. A close genetic relationship between the three invasive <i>Heracleum</i> species in Europe was also found (Jahodová <i>et al.</i> , 2007).
9. Even if the causal agent of particular symptoms has not yet been fully identified, has it been shown to produce consistent symptoms and to be transmissible?		
10. Is the organism in its area of current distribution a known pest (or vector of a pest) of plants or plant products?	Yes	Where present in the EPPO region, <i>H. sosnowskyi</i> is considered invasive in managed and unmanaged ecosystems, being a threat to biodiversity, eroding riverbanks, and posing a health risk - causing skin blistering on contact.
11. Does the organism have intrinsic attributes that indicate that it could cause significant harm to plants?		

12 Does the pest occur in the PRA area?	Yes	
13. Is the pest widely distributed in the PRA area?	No	<i>H. sosnowskyi</i> is considered moderately widely distributed in the EPPO region.
14. Does at least one host-plant species (for pests directly affecting plants) or one suitable habitat (for non parasitic plants) occur in the PRA area (outdoors, in protected cultivation or both)?	Yes	
15. If a vector is the only means by which the pest can spread, is a vector present in the PRA area? (if a vector is not needed or is not the only means by which the pest can spread go to 16)	/	A vector is not needed.
16. Does the known area of current distribution of the pest include ecoclimatic conditions comparable with those of the PRA area or sufficiently similar for the pest to survive and thrive (consider also protected conditions)?	Yes	
17. With specific reference to the plant(s) or habitats which occur(s) in the PRA area, and the damage or loss caused by the pest in its area of current distribution, could the pest by itself, or acting as a vector, cause significant damage or loss to plants or other negative economic impacts (on the environment, on society, on export markets) through the effect on plant health in the PRA area?	Yes	Damages on agriculture, health and habitats are mainly recorded in Latvia.
18. This pest could present a risk to the PRA area.	Yes	

19. The pest does not qualify as a quarantine pest for the PRA area and the assessment for this pest can stop.		
---	--	--

Section 2B: Pest Risk Assessment - Probability of introduction/spread and of potential economic consequences

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		<p>Note: If the most important pathway is intentional import, do not consider entry, but go directly to establishment. Spread from the intended habitat to the unintended habitat, which is an important judgement for intentionally imported organisms, is covered by questions 1.33 and 1.35.</p>
<p>1.1. Consider all relevant pathways and list them</p>		<p>Relevant pathways are the following:</p> <ul style="list-style-type: none"> - involuntary introduction with soil/growing medium (with organic matters) as a commodity - involuntary introduction with soil as a contaminant on used machinery - involuntary introduction with soil as a contaminant on vehicles - involuntary introduction with soil as a contaminant on footwear <p>Closed pathway:</p> <ul style="list-style-type: none"> - voluntary introduction as a fodder crop or as a meliferous plant. It was introduced into North Western Russia at the end of the 1940s, for evaluation in experimental farms as a potential forage crop. From the 1960s, it was cultivated for forage over wider areas in Russia, Belarus, Ukraine and the Baltic States. It was also tested in German Democratic Republic, Hungary and Poland. The species is not used anymore as a fodder crop, except in Russia, where it is native. This pathway is therefore considered unlikely. <p>Hypothetical pathways:</p> <ul style="list-style-type: none"> - involuntary introduction with plants for planting with growing media: this pathway has never been recorded. - voluntary introduction of dried umbels for decoration. Dried umbels are reported to be used for decoration in Baltic countries (A. Garkaje, pers. com., 2007), but introduction possibly resulting from this pathway has never been reported. - voluntary introduction as an ornamental plant has not been recorded, and the species is not recorded in the PPP index (see website). Nevertheless, since there are some measures in place in countries to ban the trade of <i>H. mantegazzianum</i> (e.g. the UK), some horticulturists might consider <i>H. sosnowskyi</i> as an alternative plant, but it will not be considered further.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		<p>Natural spread - natural spread by wind and on the fur of animals (cattle): this is not considered in the entry pathways analysis as it mainly contributes to local spread.</p>
<p>1.2. Estimate the number of relevant pathways, of different commodities, from different origins, to different end uses.</p>	<p>Moderate Low uncertainty</p>	
<p>1.3. Select from the relevant pathways, using expert judgement, those which appear most important. If these pathways involve different origins and end uses, it is sufficient to consider only the realistic worst-case pathways. The following group of questions on pathways is then considered for each relevant pathway in turn, as appropriate, starting with the most important.</p>		<ul style="list-style-type: none"> - involuntary introduction with soil as a commodity - involuntary introduction with soil as a contaminant on used machinery - involuntary introduction with soil as a contaminant on vehicles - involuntary introduction with soil as a contaminant on footwear
<p>Pathway n°: 1 This pathway analysis should be conducted for all relevant pathways</p>		<p>Soil/growing medium (with organic matters) as a commodity</p>
<p>1.4. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?</p>	<p>Likely Low uncertainty</p>	<p>In the infested area, the soil of gardens, road sides, pastures, waste lands, etc. can be infested with seeds. Fruits are 7-9 x 5-6 mm and each mericarp contains one seed (Moravcová <i>et al.</i>, 2007). Soil for use as a growing medium could be taken from places containing seeds of <i>H. sosnowskyi</i>.</p>
<p>1.5. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?</p>	<p>Moderate Low uncertainty</p>	<p>A plant of <i>H. sosnowskyi</i> has been reported to produce on average 8836 fruits in the Leningrad area, Russia (Tkachenko, 1989). The majority of seeds (98.2%) are distributed in the upper soil layer of 0-5 cm (Moravcová <i>et al.</i>, 2007) which will be taken for soil as a growing medium. Soil sterilization could kill the seeds, but it is neither required nor done.</p>

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.6. How large is the volume of the movement along the pathway?	Low to moderate High uncertainty	There is no data available, the volume of soil is considered to be low to moderate.
1.7. How frequent is the movement along the pathway?	Low to moderate High uncertainty	There is no data available, the frequency of soil is considered to be low to moderate.
1.8. How likely is the pest to survive during transport/storage?	Likely Low uncertainty	Seeds may remain viable for up to 15 years when stored dry but in the field this period is apparently much shorter – only 8.8% of seeds buried in the soil survived 1 year, 2.7% lasted 2 years and 1.2% remained viable and dormant after 3 years (Moravcová <i>et al.</i> , 2007). Correspondingly, no viable seeds were found in a <i>Heracleum</i> site after 7 years of sheep grazing (Andersen & Calov, 1996). However, experiments in regions where <i>H. sosnowskyi</i> is invasive are needed to verify this (Moravcová <i>et al.</i> , 2007).
1.9. How likely is the pest to multiply/increase in prevalence during transport /storage?	Very unlikely Low uncertainty	Seeds do not multiply.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.10. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	Likely in EU Unlikely in non EU EPPO countries Low uncertainty	<p>The species is present in: Armenia (native), Azerbaidzhan, Russia (Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia, Ingushetia, Chechnya, Dagestan and possibly Black Sea coast), Belarus, Estonia, Germany, Hungary, Latvia, Lithuania, Poland, Russia (Central and Northern), Ukraine (introduced).</p> <p>For EPPO EU Countries: Soil or growing media coming from Turkey, Belarus, Moldova, Russia, Ukraine and third countries not belonging to continental Europe, other than Egypt, Israel, Libya, Morocco, Tunisia is prohibited of import.</p> <p>There are no specific requirements for soil or growing media coming from authorised countries where the species occurs (Germany, Hungary, Poland, etc.).</p> <p>Seeds can easily remain undetected as no attention is paid to this species. EU countries are therefore at risk since soil could be imported from countries where <i>H. sosnowskyi</i> is present.</p> <p>In other EPPO countries, import of soil is prohibited, and these countries are not at risk.</p>
1.11. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	Widely Medium uncertainty	There is no data available, but soil could be traded in the whole European Union.
1.12. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	Yes	Whatever the time of arrival, seeds can remain viable for several months and wait until suitable conditions to germinate.
1.13. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	Unlikely Low uncertainty	There is a low probability that seeds will escape from soil during transportation. Seeds are only in the upper layer of soil, so when taking soil, these seeds will be covered by soil which occurred deeper.
1.14. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products)	Likely High uncertainty	<p>Whether soil is usually used for planting or other purposes (e.g. constructions) in unknown.</p> <p>When soil is used for planting, it will be used in gardens, road sides, nurseries, fields, natural or semi-natural areas, etc. which are suitable habitats for the plant.</p>

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
to aid transfer to a suitable host or habitat?		
1.15. Do other pathways need to be considered?	No	
Pathway n°: 2 This pathway analysis should be conducted for all relevant pathways		Soil as a contaminant on used machinery
1.4. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	Likely Low uncertainty	In infested areas, the soil of fields, gardens, road sides, pastures, waste lands, etc. can be infested with seeds. Fruits are 7-9 x 5-6 mm and each mericarp contains one seed (Moravcová <i>et al.</i> , 2007). Seeds and are recorded to be spread by vehicles. In contaminated countries, some management measures of infested fields include mechanical removal with machinery, increasing the probability of the pest being associated on used machinery. Seeds can therefore easily and widely be dispersed by soil as a contaminant of soil on agricultural machinery and tools. Vehicles are usually mainly driven on road sides, and the probability of the pest to be on tires of vehicles is less likely than on machinery.
1.5. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	Major Low uncertainty	It is assumed that there are rarely requirements for cleaning of agricultural used machinery nor tools. The species occur in agricultural fields where machinery is used. A plant of <i>H. sosnowskyi</i> has been reported to produce on average 8836 fruits in the Leningrad area, Russia (Tkachenko, 1989). The majority of seeds (98.2%) are distributed in the upper soil layer of 0-5 cm, with little in the deeper layers of 6-10 cm and 11-15 cm (Moravcová <i>et al.</i> , 2007), the upper soil layer being the one in contact with machinery.
1.6. How large is the volume of the movement along the pathway?	Low High uncertainty	There is no data available, but the volume of used machinery crossing borders is considered to be low.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.7. How frequent is the movement along the pathway?	Low High uncertainty	There is no data available, the frequency of movement of used machinery crossing borders is considered to be low.
1.8. How likely is the pest to survive during transport/storage?	Very likely Low uncertainty	Seeds may remain viable for up to 15 years when stored dry but in the field this period is apparently much shorter – only 8.8% of seeds buried in the soil survived 1 year, 2.7% lasted 2 years and 1.2% remained viable and dormant after 3 years (Moravcová <i>et al.</i> , 2007). Correspondingly, no viable seeds were found in a <i>Heracleum</i> site after 7 years of sheep grazing (Andersen & Calov, 1996). However, experiments in regions where <i>H. sosnowskyi</i> is invasive are needed to verify this (Moravcová <i>et al.</i> , 2007).
1.9. How likely is the pest to multiply/increase in prevalence during transport /storage?	Very unlikely Low uncertainty	Seeds do not multiply.
1.10. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	Very likely Low uncertainty	Few phytosanitary measures are in place for soil as a contaminant on machinery, and they do not specifically target <i>H. sosnowskyi</i> .
1.11. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	Moderate Low uncertainty	This is not a commodity pathway, but machinery are moderately likely to be exchanged over large distances, and is supposed to be limited to neighbouring countries.
1.12. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	Yes	This is not a commodity pathway, but whatever the time of arrival, seeds can remain viable for several months and wait until suitable conditions to germinate.
1.13. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	Likely Low uncertainty	Used machinery are intended to be driven on fields and roadsides, which are very suitable habitats for <i>H. sosnowskyi</i> . The species could then be introduced into other fields and roadsides and could then spread very easily to riversides, fallows, etc.
1.14. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption,		Not relevant, this is not a commodity pathway.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?		
1.15. Do other pathways need to be considered?		Yes
Pathway n°: 3 This pathway analysis should be conducted for all relevant pathways		Soil as a contaminant on used vehicles
1.4. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	Unlikely Low uncertainty	In infested areas, the soil of fields, gardens, road sides, pastures, waste lands, etc. can be infested with seeds. Fruits are 7-9 x 5-6 mm and each mericarp contains one seed (Moravcová <i>et al.</i> , 2007). Seeds and are recorded to be spread by vehicles. Vehicles are usually mainly driven on road sides, and the probability of the pest to be on tires of vehicles is less likely than on machinery.
1.5. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	Moderate Low uncertainty	It is assumed that there are rarely requirements for cleaning of agricultural used machinery nor tools and vehicles. The species occur in agricultural fields where machinery is used. A plant of <i>H. sosnowskyi</i> has been reported to produce on average 8836 fruits in the Leningrad area, Russia (Tkachenko, 1989). The majority of seeds (98.2%) are distributed in the upper soil layer of 0-5 cm, with little in the deeper layers of 6-10 cm and 11-15 cm (Moravcová <i>et al.</i> , 2007), the upper soil layer being the one in contact with vehicles. Tires of machinery are bigger than tires of vehicles; the quantity of seeds contaminating machinery is therefore supposed to be higher than for vehicles.
1.6. How large is the volume of the movement along the pathway?	High High uncertainty	There is no data available, but the volume of vehicles crossing borders is considered to be high.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.7. How frequent is the movement along the pathway?	High High uncertainty	There is no data available, the frequency of movement of vehicles crossing borders is considered to be high. Movement of vehicles is easy within the European Union, and will be even easier with possible extension of the Schengen borders.
1.8. How likely is the pest to survive during transport/storage?	Very likely Low uncertainty	Seeds may remain viable for up to 15 years when stored dry but in the field this period is apparently much shorter – only 8.8% of seeds buried in the soil survived 1 year, 2.7% lasted 2 years and 1.2% remained viable and dormant after 3 years (Moravcová <i>et al.</i> , 2007). Correspondingly, no viable seeds were found in a <i>Heracleum</i> site after 7 years of sheep grazing (Andersen & Calov, 1996). However, experiments in regions where <i>H. sosnowskyi</i> is invasive are needed to verify this (Moravcová <i>et al.</i> , 2007).
1.9. How likely is the pest to multiply/increase in prevalence during transport /storage?	Very unlikely Low uncertainty	Seeds do not multiply.
1.10. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	Very likely Low uncertainty	No phytosanitary measures are in place for soil as a contaminant on vehicles, and they do not specifically target <i>H. sosnowskyi</i> .
1.11. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	Widely for vehicle Low uncertainty	This is not a commodity pathway, but vehicles can travel everywhere in the PRA area for tourism and transport of people.
1.12. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	Yes	This is not a commodity pathway, but whatever the time of arrival, seeds can remain viable for several months and wait until suitable conditions to germinate.
1.13. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	Likely Low uncertainty	Vehicles could spread the plant on roadsides, fallowlands, etc. which are suitable habitats for the species.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.14. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?		Not relevant, this is not a commodity pathway.
1.15. Do other pathways need to be considered?		Yes
Pathway n°: 4 This pathway analysis should be conducted for all relevant pathways		Soil as a contaminant on footwear
1.4. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	Moderately likely Low uncertainty	In infested areas, the soil of fields, gardens, road sides, pastures, waste lands, etc. can be infested with seeds. Fruits are 7-9 x 5-6 mm and each mericarp contains one seed (Moravcová <i>et al.</i> , 2007). Seeds can easily and widely be dispersed travellers' foot wear.
1.5. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	Low Low uncertainty	A plants of <i>H. sosnowskyi</i> has been reported to produce on average 8836 fruits in the Leningrad area, Russia (Tkachenko, 1989). The majority of seeds (98.2%) are distributed in the upper soil layer of 0-5 cm, with little in the deeper layers of 6-10 cm and 11-15 cm (Moravcová <i>et al.</i> , 2007), the upper soil layer being the one in contact with footwear. Nevertheless, the surface of a shoe does not allow for a high concentration of seeds of <i>H. sosnowskyi</i> . There are no requirements on footwear.
1.6. How large is the volume of the movement along the pathway?	High Medium uncertainty	There is no data available, the volume of people travelling is considered to be high.
1.7. How frequent is the movement along the pathway?	High Medium uncertainty	No data available, the frequency of people travelling is considered to be high. Movement of people is easy within the European Union, and will be even easier with possible extension of the Schengen borders.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.8. How likely is the pest to survive during transport/storage?	Very likely Low uncertainty	Seeds may remain viable for up to 15 years when stored dry but in the field this period is apparently much shorter – only 8.8% of seeds buried in the soil survived 1 year, 2.7% lasted 2 years and 1.2% remained viable and dormant after 3 years (Moravcová <i>et al.</i> , 2007). Correspondingly, no viable seeds were found in a <i>Heracleum</i> site after 7 years of sheep grazing (Andersen & Calov, 1996). However, experiments in regions where <i>H. sosnowskyi</i> is invasive are needed to verify this (Moravcová <i>et al.</i> , 2007).
1.9. How likely is the pest to multiply/increase in prevalence during transport /storage?	Very unlikely Low uncertainty	Seeds do not multiply.
1.10. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	Very likely Low uncertainty	No measures are in place for soil as a contaminant on travellers' footwear.
1.11. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	Widely Low uncertainty	This is not a commodity pathway, but travellers can go everywhere in the PRA area.
1.12. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	Yes	This is not a commodity pathway, but whatever the time of arrival, seeds can remain viable for several months and wait until suitable conditions to germinate.
1.13. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	Likely Low uncertainty	Footwear could spread the plant on roadsides, fallowlands, etc. which are suitable habitats for the species.
1.14. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?		Not relevant, this is not a commodity pathway.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.15. Do other pathways need to be considered?		Yes
Conclusion on the probability of entry. Risks presented by different pathways.		<ul style="list-style-type: none"> - Soil/growing medium (with organic matters) as a commodity: moderately likely in EU countries, unlikely in non EU EPPO countries. - Involuntary entry with soil as a contaminant on used machinery: moderately likely - Involuntary entry with soil as a contaminant on used vehicles: moderately likely - Involuntary entry with soil as a contaminant on footwear: moderately likely
1.16. Estimate the number of host plant species or suitable habitats in the PRA area (see question 6).	Many Low uncertainty	Grasslands, forests, wetlands, riverbanks/canal sides, rail/roadsides, woodland, grasslands, the edges of clearings, rubbish dumps and waste ground and urban areas are suitable habitats.
1.17. How widespread are the host plants or suitable habitats in the PRA area? (specify)	Widely Low uncertainty	These habitats are very widely distributed in the EPPO region.
1.18. If an alternate host or another species is needed to complete the life cycle or for a critical stage of the life cycle such as transmission (e.g. vectors), growth (e.g. root symbionts), reproduction (e.g. pollinators) or spread (e.g. seed dispersers), how likely is the pest to come in contact with such species?	Not relevant	No alternate host needed.
1.19. How similar are the climatic conditions that would affect pest establishment, in the PRA area and in the current area of distribution?	Similar Low uncertainty	<i>H. sosnowskyi</i> is native from the mountainous areas: Caucasus, Transcaucasia, and North-East Turkey (Jahodová <i>et al.</i> , 2007) but is invasive in Baltic countries having a different climate, where it has been introduced as a fodder crop. It is associated with areas with warm to hot wet summers and cool wet winters. It is not favoured by dried conditions. It is winter hardy down to -25°C. Seeds germinate in early

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		spring (but not during summer) and require a period of cold stratification for breaking dormancy (less than 2 month). This makes the plant adapted to temperate climates, and possibly to Mediterranean climates.
1.20. How similar are other abiotic factors that would affect pest establishment, in the PRA area and in the current area of distribution?	Similar Low uncertainty	<i>H. sosnowskyi</i> develops in fresh and slightly moist, neutral soils, rich in nutrients, ranging from pH 6.3 to 7.0. <i>H. sosnowskyi</i> communities have developed in artificial and seminatural habitats over the last 20 years. They are nitrophilous and their expansion is stimulated by eutrophication of the environment (Laivins & Gavrilova, 2003). <i>H. sosnowskyi</i> is a light demanding plant which cannot tolerate shade in the first growth stages (Oboļeviča 2001).
1.21. If protected cultivation is important in the PRA area, how often has the pest been recorded on crops in protected cultivation elsewhere?	Not relevant	
1.22. How likely is it that establishment will occur despite competition from existing species in the PRA area?	Very likely Low uncertainty	<i>H. sosnowskyi</i> already established in the PRA area. In amenity areas, established colonies compete strongly with, and rapidly replace most other plants except trees. Along riverbanks, it can almost totally replace the natural vegetation (Nielsen <i>et al.</i> , 2005).
1.23. How likely is it that establishment will occur despite natural enemies already present in the PRA area?	Very likely Low uncertainty	<i>H. sosnowskyi</i> already established in the PRA area, and there is no record of natural enemies.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.24. To what extent is the managed environment in the PRA area favourable for establishment?	Favourable Low uncertainty	<i>H. sosnowskyi</i> is very often found in managed habitats, since it was planted as a fodder crop, and is reported in abandoned agricultural land, particularly in Latvia (Thiele <i>et al.</i> , 2007). <i>H. sosnowskyi</i> communities have developed in artificial and seminatural habitats over the last 20 years. They are nitrophilous and their expansion is stimulated by eutrophication of the environment (Laivins & Gavrilova, 2003).
1.25. How likely is it that existing pest management practice will fail to prevent establishment of the pest?	Very likely Low uncertainty	In managed habitats such as pastures and road sides, usual measure is cutting. This existing measure is usually insufficient since there is rapid re-growth from below ground, and it may encourage the flowering of the plant (Holm, 2005). There are no existing pest management practice in the unmanaged habitats (river banks) that these species invade.
1.26. Based on its biological characteristics, how likely is it that the pest could survive eradication programmes in the PRA area?	Moderately likely Medium uncertainty	Seed longevity is expected to be 7 year (Andersen & Calov, 1996). Eradication is possible for early infestations. Once the species covers large area, it is proving difficult to manage (eg. Latvia).
1.27. How likely is the reproductive strategy of the pest and the duration of its life cycle to aid establishment?	Likely Low uncertainty	The flowers of <i>H. sosnowskyi</i> are insect-pollinated and self compatible. Reproduction is exclusively by seeds. A plant of <i>H. sosnowskyi</i> has been reported to produce on average 8836 fruits in the Leningrad area, Russia (Tkachenko, 1989). The majority of seeds (98.2%) are distributed in the upper soil layer of 0-5 cm, with little in the deeper layers of 6-10 cm and 11-15 cm (Moravcová <i>et al.</i> , 2007). Seeds may remain viable for up to 15 years when stored dry, but in the field this period is reduced to 7 years (Andersen & Calov, 1996).

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.28 How likely are relatively small populations to become established?	Likely Low uncertainty	The species is already established in the EPPO region and according to Jahodová <i>et al.</i> (2007), it is likely that the current pattern of genetic diversity in Europe resulted from multiple introductions of <i>H. sosnowskyi</i> . The same phenomenon has been observed for <i>H. mantegazzianum</i> and <i>H. persicum</i> . The current populations of <i>H. sosnowskyi</i> had enough diversity to establish and to become invasive.
1.29. How adaptable is the pest?	Moderate Medium uncertainty	No subspecies or pathotypes are reported, but the species appear in a wide range of habitats and climates.
1.30. How often has the pest been introduced into new areas outside its original area of distribution? (specify the instances, if possible)	Rarely Low uncertainty	It has been introduced in few countries outside its native range.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.31. If establishment of the pest is very unlikely, how likely are transient populations to occur in the PRA area through natural migration or entry through man's activities (including intentional release into the environment) ?	Not relevant	The plant is established in the EPPO region.
Conclusion on the probability of establishment	Moderately likely Low uncertainty	The species is already established in the EPPO region, though it has been planted in these places. It is likely to enter new countries as a contaminant, through seeds, which require cold temperatures for 2 months.
1.32. How likely is the pest to spread rapidly in the PRA area by natural means?	Moderately likely Low uncertainty	The plant does not reproduce vegetative , but seeds are dispersed locally near the mother plants and over long distances by watercourses.
1.33. How likely is the pest to spread rapidly in the PRA area by human assistance?	Moderately likely Low uncertainty	<i>H. sosnowskyi</i> has been widely planted as a fodder crop in the 60s and covered 12 000 ha in Latvia in 2002 (Cabinet of Ministers Order No. 426), but it is not planted anymore. Movement also occurs through accidental human activities: collection of seed-heads for ornament followed by disposal on rubbish heaps; movement of soil during building and excavation; movement along roads or railways by attachment to vehicles or by air currents; movement by agricultural and forest tractors which carry seeds stuck to radiators and roofs. The seed can also be transported attached to clothes or animal fur (e.g. sheep and cattle) (Nielsen <i>et al.</i> , 2005).
1.34. Based on biological characteristics, how likely is it that the pest will not be contained within the PRA area?	Moderately likely Medium uncertainty	Considering that the species only reproduce by seeds, and that seeds have a supposed longevity of 7 years (Andersen & Calov, 1996), it should be possible to contain the species.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
Conclusion on the probability of spread	Moderately likely Medium uncertainty	Although the species could be contained if measures would be taken, the species has biological characteristics allowing both natural and human assisted spread, and has expanded its range in countries such as Germany .
Conclusion on the probability of introduction and spread The overall probability of introduction and spread should be described. The probability of introduction and spread may be expressed by comparison with PRAs on other pests.		Introduction has already occurred, and combining the probabilities of entry and establishment, probability of entry is considered to be moderately likely.
Conclusion regarding endangered areas 1.35. Based on the answers to questions 1.16 to 1.34 identify the part of the PRA area where presence of host plants or suitable habitats and ecological factors favour the establishment and spread of the pest to define the endangered area.		Grasslands, forests, wetlands, riverbanks/canal sides, rail/roadsides, woodland, grasslands, the edges of clearings, rubbish dumps and waste ground and urban areas of the temperate EPPO region (northern and central parts), and possibly of the Mediterranean area.
2. In any case, providing replies for all hosts (or all habitats) and all situations may be laborious, and it is desirable to focus the assessment as much as possible. The study of a single worst-case may be sufficient. Alternatively, it may be appropriate to consider all hosts/habitats together in answering the questions once. Only in certain circumstances will it be necessary to answer the questions separately for specific hosts/habitats.		

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
<p>2.1. How great a negative effect does the pest have on crop yield and/or quality to cultivated plants or on control costs within its current area of distribution?</p>	<p>Moderate to major Low uncertainty</p>	<p>There are no records of direct impact on crops. Significant costs are incurred by the measures taken to control the weed in amenities and other areas, as well as to turn the land back to agricultural area, particularly in Baltic countries (A. Garkaje, pers com., 2007). This management activity is also likely to increase soil erosion along stream banks where the plant occurs. In Latvia, the fungus <i>Sclerotinia sclerotiorum</i> has been observed on the plant. Farmers are making efforts to get ride of this fungus (A. Pence, pers com., 2006). Only in Latvia, the total cost of the 2006-2012 control program of this species is estimated 12 000 000 euros (Cabinet of Ministers Order No. 426), but it should be highlighted that the situation in this country is particular since the species has been planted over large areas in the past.</p>
<p>2.2. How great a negative effect is the pest likely to have on crop yield and/or quality in the PRA area without any control measures?</p>	<p>Minimal to moderate Medium uncertainty</p>	<p>In other countries than the ones where the species is already present, impact are expected to be lower than in the Baltic States, since there had been extensive planting of the species in these countries.</p>

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
2.3. How easily can the pest be controlled in the PRA area without phytosanitary measures?	With some difficulty Medium uncertainty	There are some existing control measures (chemical and mechanical), though, they have to be applied with care, otherwise the species may re-grow. Another difficulty arises from the fact that the species grows in habitats which are not usually managed, such as fallow lands, natural and semi-natural habitats.
2.4. How great an increase in production costs (including control costs) is likely to be caused by the pest in the PRA area?	Minimal Low uncertainty	There are no records of direct impact on crops, but the plant is recorded to grow in pastures.
2.5. How great a reduction in consumer demand is the pest likely to cause in the PRA area?	Minor Low uncertainty	Plantation schemes were eventually abandoned in the Baltic States, partly because the anise scented plants affected the flavour of meat and milk from the animals to which it was fed and partly because of the health risk to humans and cattle (Nielsen <i>et al.</i> , 2005). Consumer may therefore request milk and meat of animals which have not been fed on <i>H. sosnowskyi</i> . Nevertheless, the species has been planted over large areas in Latvia, and this is unlikely to be the case in other countries, animals are therefore not supposed to be fed on this plant.
2.6. How important is environmental damage caused by the pest within its current area of distribution?	Minor Medium uncertainty	<i>Heracleum</i> spp. can create stands that may range in extent from square metres to hectares; small patches, linear stands or fringes can be found. The density of populations may also vary: in large stands, it ranges from sparse growth (1-3 adult individuals/10 m ²) to almost entire ground cover (more than 20 adult individuals/10 m ²) (Nielsen <i>et al.</i> , 2005). A strong decline in species richness has been observed in abandoned grasslands and ruderal habitats in Latvia due to <i>H. sosnowskyi</i> presence (Nielsen <i>et al.</i> , 2005). In amenity areas, established colonies compete strongly with, and rapidly replace most other plants except trees. Along riverbanks, it can almost totally replace the natural vegetation and threaten biodiversity, including fauna associated with (native) plants, building a 'giant hogweed landscape' (Nielsen <i>et al.</i> , 2005). Nevertheless, these impacts are nuanced in Thiele and Otte (2007), stating loss of plant species diversity in habitats invaded by <i>H. mantegazzianum</i> in Germany is a general symptom of successional changes rather than a particular effect of invasive species. Hybridization of both <i>H. mantegazzianum</i> and <i>H. sosnowskyi</i> with the native <i>Heracleum</i>

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		<i>sibiricum</i> is expected in Lithuania (Z. Gudžinskas, pers. comm., 2007).
2.7. How important is the environmental damage likely to be in the PRA area (see note for question 2.6)?	Minimal Medium uncertainty	In other countries than the ones where the species is already present, impact are expected to be lower than in the Baltic States, since there had been extensive planting of the species in these countries.
2.8. How important is social damage caused by the pest within its current area of distribution?	Major Low uncertainty	<p><i>H. sosnowskyi</i> contains photosensitizing furanocoumarins. In contact with the human skin and in combination with ultraviolet radiation, a phytotoxic reaction can occur 15 minutes after contact, with a sensitivity peak between 30 min and 2 hours causing burnings of the skin.</p> <p>After about 24 hours, flushing or reddening of the skin (erythema) and excessive accumulation of fluid in the skin (edema) appear, followed by an inflammatory reaction after three days. Approximately one week later a hyper-pigmentation (usually darkening the skin) occurs which can last for months. The affected skin may remain sensitive to ultraviolet for years.</p> <p>In addition, several furanocoumarins have been reported to cause cancer (carcinogenic) and to cause malformation in the growing embryo (teratogenic) (Nielsen <i>et al.</i>, 2005).</p> <p>Moreover, dense infestations can seriously interfere with access to amenity areas, riverbanks, etc., and along roadsides, large stands can reduce visibility and result in road safety hazards.).</p> <p>Plantation schemes were eventually abandoned in the Baltic States, partly because the anise scented plants affected the flavour of meat and milk from the animals to which it was fed and partly because of the health risk to humans and cattle (Nielsen <i>et al.</i>, 2005).</p>
2.9. How important is the social damage likely to be in the PRA area?	Moderate Medium	In other countries than the ones where the species is already present, impacts are expected to be lower than in the Baltic States, since there had been extensive planting of the species in these countries.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
	uncertainty	
2.10. How likely is the presence of the pest in the PRA area to cause losses in export markets?	Unlikely	There are no interception records for this species.
<p>As noted in the introduction to section 2, the evaluation of the following questions may not be necessary if the responses to question 2.2 is "major" or "massive" and the answer to 2.3 is "with much difficulty" or "impossible" or any of the responses to questions 2.4, 2.5, 2.7, 2.9 and 2.10 is "major" or "massive" or "very likely" or "certain". You may go directly to point 2.16 unless a detailed study of impacts is required or the answers given to these questions have a high level of uncertainty.</p>		
<p>Degree of uncertainty Estimation of the probability of introduction of a pest and of its economic consequences involves many uncertainties. In particular, this estimation is an extrapolation from the situation where the pest occurs to the hypothetical situation in the PRA area. It is important to document the areas of uncertainty (including identifying and prioritizing of additional data to be collected and research to be conducted) and the degree of uncertainty in the assessment, and to indicate where expert judgement has been used. This is necessary for transparency and may also</p>		<p>When performing the PRA the following uncertainties have been identified:</p> <ul style="list-style-type: none"> - Longevity of seeds - Soil pathway: volumes, frequency, uses - Climatic prediction for the species and ability to establish in the Mediterranean area - Impact on environment

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
<p>be useful for identifying and prioritizing research needs.</p> <p>It should be noted that the assessment of the probability and consequences of environmental hazards of pests of uncultivated plants often involves greater uncertainty than for pests of cultivated plants. This is due to the lack of information, additional complexity associated with ecosystems, and variability associated with pests, hosts or habitats.</p>		
<p>Evaluate the probability of entry and indicate the elements which make entry most likely or those that make it least likely. Identify the pathways in order of risk and compare their importance in practice.</p>	<p>Moderately likely</p> <p>Medium uncertainty</p>	<ul style="list-style-type: none"> - Soil/growing medium (with organic matters) as a commodity: moderately likely in EU countries, unlikely in non EU EPPO countries. - Involuntary entry with soil as a contaminant on used machinery: moderately likely The probability of <i>H. sosnowskyi</i> to be on tires of used machinery is quite high, but the movement of such machinery is considered to be restricted to local areas, or neighbouring countries. - Involuntary entry with soil as a contaminant on used vehicles: moderately likely. The probability of the seed of <i>H. sosnowskyi</i> to be a contaminant of vehicles is lower than its probability to be associated to machinery, but the movement of vehicles is more frequent and widespread than the movement of machinery. - Involuntary entry with soil as a contaminant on footwear: moderately likely. - Voluntary entry for agricultural (used as a fodder, melferifous plant) or ornamental purposes: unlikely. The species is not used as a fodder anymore, and there is no record of its use as an ornamental plant.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
Evaluate the probability of establishment, and indicate the elements which make establishment most likely or those that make it least likely. Specify which part of the PRA area presents the greatest risk of establishment.	Likely	<i>H. sosnowskyi</i> is already established in some countries of the EPPO region, though, it has been planted there, and the species is unlikely to be planted in other countries. The species would enter a new country as a seed, and it has a short longevity and needs cold temperatures for 2 months. The temperate countries seem to have a more suitable climate, but the Mediterranean area could also be at risk as well.
List the most important potential economic impacts, and estimate how likely they are to arise in the PRA area. Specify which part of the PRA area is economically most at risk.		The most important impact are on: <ul style="list-style-type: none"> - Human health, - Erosion of river banks - Costs of management of the plant - Impact on biodiversity through competition with other species
The risk assessor should give an overall conclusion on the pest risk assessment and an opinion as to whether the pest or pathway assessed is an appropriate candidate for stage 3 of the PRA: the selection of risk management options, and an estimation of the associated pest risk.		The species represent a threat to human health, land and biodiversity in Baltic countries, where the plant has been largely planted. Voluntary introduction is unlikely, and the most likely entry pathways identified are not regulated (in the European Union). National management measures could be efficient measures as well.

This is the end of the Pest risk assessment	
--	--

Stage 3: Pest risk Management

Question	Y/N	Explanatory text
3.1. Is the risk identified in the Pest Risk Assessment stage for all pest/pathway combinations an acceptable risk?	No	
Pathway 1		Involuntary entry as a contaminant of soil
3.2 Is the pathway that is being considered a commodity of plants and plant products? If yes, go to 3.11, If no, go to 3.3	Yes	
3.11 If the pest is a plant, is it the commodity itself? If yes, go to 3.29, If no (the pest is not a plant or the pest is a plant but is not the commodity itself), go to 3.12	No	
3.12 Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest? if appropriate, list the measures and identify their efficacy against the pest of concern, Go to 3.13	Yes/ No	Import of soil and growing medium as a commodity is prohibited in many EPPO countries from non-EU countries, but not in EU countries.
3.13 Can the pest be reliably detected by a visual inspection of a consignment at the time of export, during transport/storage or at import? If yes, possible measure: visual inspection, go to 3.14	No	
3.14 Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)? If yes, possible measure: specified testing, go to 3.15	No	

<p>3.15 Can the pest be reliably detected during post-entry quarantine?</p> <p>If yes, possible measure: import under special licence/permit and post-entry quarantine, go to 3.16</p>	No	
<p>3.16 Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?</p> <p>If yes, possible measure: specified treatment, go to 3.17</p>	No	Heat treatment or soil sterilization could be possible against this pest but it may prove expensive.
<p>3.17 Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment? (This question is not relevant for pest plants)</p> <p>If yes, possible measure: removal of parts of plants from the consignment, go to 3.18</p>	No	Not relevant
<p>3.18 Can infestation of the consignment be reliably prevented by handling and packing methods?</p> <p>If yes, possible measure: specific handling/packing methods, go to 3.19</p>	No	Not relevant
<p>3.19 Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?</p> <p>If yes, possible measure: import under special licence/permit and specified restrictions, go to 3.20</p>	No	
<p>3.20 Can infestation of the commodity be reliably prevented by treatment of the crop?</p> <p>If yes, possible measure: specified treatment and/or period of treatment, go to 3.21</p>	No	Not relevant

<p>3.21 Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)</p> <p>If yes, possible measure: consignment should be composed of specified cultivars, go to 3.22</p>	No	Not relevant.
<p>3.22 Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions such as screened greenhouses, physical isolation, sterilized growing medium, exclusion of running water, etc.)?</p> <p>If yes, possible measure: specified growing conditions, go to 3.23</p>	No	Not relevant
<p>3.23 Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?</p> <p>If yes, possible measure: specified age of plant, growth stage or time of year of harvest, go to 3.24</p>	No	Not relevant.
<p>3.24. Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?</p> <p>If yes, possible measure: certification scheme, go to 3.25</p>	No	Not relevant
<p>3.25 Is the pest of very low capacity for natural spread?</p> <p>If yes, possible measures: pest freedom of the crop, or pest-free place of production or pest-free area, Go to 3.28</p> <p>If no, go to 3.26</p>	No	
<p>3.26 Is the pest of low to medium capacity for natural spread?</p> <p>If yes, Go to 3.28</p> <p>If no, go to 3.27</p>	Yes	The plant can be spread by river courses, and on the fur of animals. This means that the soil or growing medium has to be collected in a pest-free place of production or a pest-free area.

<p>3.27 The pest is of medium to high capacity for natural spread</p> <p>Possible measure: pest-free area, go to 3.28</p>		
<p>3.28 Can pest freedom of the crop, place of production or an area be reliably guaranteed?</p> <p>If no, possible measure identified in questions 3.25-3.27 would not be suitable, go to 3.29</p>	Yes	
<p>3.29 Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?</p> <p>If yes, possible measures: internal surveillance and/or eradication campaign, go to 3.30</p>	Yes	Internal surveillance and/or eradication campaign.
<p>3.30 Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest? List them.</p> <p>If yes, go to 3.31 If no, go to 3.38</p>	Yes	Pest-free place of production Pest-free area Internal surveillance and/or eradication campaign
<p>3.31 Does each of the individual measures identified reduce the risk to an acceptable level?</p> <p>If yes, go to 3.34 If no, go to 3.32</p>	Yes	Pest-free place of production Pest-free area Internal surveillance and/or eradication campaign.
<p>3.34 Estimate to what extent the measures (or combination of measures) being considered interfere with trade.</p> <p>Go to 3.35</p>		Difficult to estimate.

<p>3.35 Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.</p> <p>Go to 3.36</p>		<p>These measures on soil could prevent many other pests to enter new territories and would be very cost-effective in this sense.</p> <p>Surveillance of the territory could monitor other species as well, and would be very efficient.</p>
<p>3.36 Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences?</p> <p>If yes, For pathway-initiated analysis, go to 3.39 For pest-initiated analysis, go to 3.38 If no, go to 3.37</p>	<p>Yes</p>	<p>Pest-free place of production Pest-free area Internal surveillance and/or eradication campaign</p>
<p>3.37 Envisage prohibiting the pathway</p> <p>For pathway-initiated analysis, go to 3.43 (or 3.39), For pest-initiated analysis go to 3.38</p>	<p>No</p>	
<p>3.38 Have all major pathways been analyzed (for a pest-initiated analysis)?</p> <p>If yes, go to 3.41, If no, Go to 3.1 to analyze the next major pathway</p>	<p>Yes</p>	
<p>3.39 Have all the pests been analyzed (for a pathway-initiated analysis)?</p> <p>If yes, go to 3.40, If no, go to 3.1 (to analyze next pest)</p>	<p>Yes</p>	



Pathway 1		Involuntary entry with soil as a contaminant on used machinery
<p>3.2. Is the pathway that is being considered a commodity of plants and plant products?</p> <p>If yes, go to 3.11, If no, go to 3.3</p>	No	
<p>3.3. Is the pathway that is being considered the natural spread of the pest? (see answer to question 1.32)</p> <p>If yes, go to 3.4, If no, go to 3.9</p>	No	
<p>3.9. Is the pathway that is being considered the entry with human travellers?</p> <p>If yes, possible measures: inspection of human travellers, their luggage, publicity to enhance public awareness on pest risks, fines or incentives. Treatments may also be possible, Go to 3.29 If no, go to 3.10</p>	No	
<p>3.10. Is the pathway being considered contaminated machinery or means of transport?</p> <p>If yes, possible measures: cleaning or disinfection of machinery/vehicles</p>	Yes	Possible measures: cleaning or disinfection of machinery
<p>3.29. Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?</p> <p>If yes, possible measures: internal surveillance and/or eradication campaign, go to 3.30</p>	Yes	Internal surveillance and/or eradication campaign

<p>3.30. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest? List them.</p> <p>If yes, go to 3.31 If no, go to 3.38</p>	Yes	<p>Cleaning or disinfection of machinery Internal surveillance and/or eradication campaign</p>
<p>3.31. Does each of the individual measures identified reduce the risk to an acceptable level?</p> <p>If yes, go to 3.34 If no, go to 3.32</p>	Yes	
<p>3.34. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.</p> <p>Go to 3.35</p>		<p>It does not interfere much; it is only a requirement of cleaning.</p>
<p>3.35. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.</p> <p>Go to 3.36</p>		<p>Cleaning or disinfection of machinery would prevent many other invasive alien species to enter new areas, and would be cost effective in this sense.</p> <p>Surveillance of the territory could monitor other species as well, and would be very efficient.</p>
<p>3.36. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences?</p> <p>If yes, For pathway-initiated analysis, go to 3.39 For pest-initiated analysis, go to 3.38 If no, go to 3.37</p>	Yes	<p>Cleaning or disinfection of machinery Internal surveillance and/or eradication campaign</p>

3.39. Have all the pests been analyzed (for a pathway-initiated analysis)? If yes, go to 3.40, If no, go to 3.1 (to analyze next pest)	No	

Pathway 2		Involuntary entry with soil as a contaminant on vehicles
3.2 Is the pathway that is being considered a commodity of plants and plant products? If yes, go to 3.11, If no, go to 3.3	No	
3.3 Is the pathway that is being considered the natural spread of the pest? (see answer to question 1.32) If yes, go to 3.4, If no, go to 3.9	No	
3.9 Is the pathway that is being considered the entry with human travellers? If yes, possible measures: inspection of human travellers, their luggage, publicity to enhance public awareness on pest risks, fines or incentives. Treatments may also be possible, Go to 3.29 If no, go to 3.10	No	
3.10 Is the pathway being considered contaminated machinery or means of transport? If yes, possible measures: cleaning or disinfection of machinery/vehicles	Yes	Possible measures: cleaning or disinfection of vehicles

<p>3.29 Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?</p> <p>If yes, possible measures: internal surveillance and/or eradication campaign, go to 3.30</p>	Yes	Internal surveillance and/or eradication campaign
<p>3.30 Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest? List them.</p> <p>If yes, go to 3.31 If no, go to 3.38</p>	Yes	Cleaning or disinfection of vehicles Internal surveillance and/or eradication campaign
<p>3.31 Does each of the individual measures identified reduce the risk to an acceptable level?</p> <p>If yes, go to 3.34 If no, go to 3.32</p>	Yes	
<p>3.34 Estimate to what extent the measures (or combination of measures) being considered interfere with trade.</p> <p>Go to 3.35</p>		The measure does not interfere with trade since this is not a commodity pathway.
<p>3.35 Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.</p> <p>Go to 3.36</p>		<p>Cleaning or disinfection of vehicle is not realistic, considering the huge movement of vehicles.</p> <p>Surveillance of the territory could monitor other species as well, and would be very efficient.</p>

<p>3.36 Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences?</p> <p>If yes, For pathway-initiated analysis, go to 3.39 For pest-initiated analysis, go to 3.38 If no, go to 3.37</p>	Yes	Internal surveillance and/or eradication campaign
<p>3.39 Have all the pests been analyzed (for a pathway-initiated analysis)?</p> <p>If yes, go to 3.40, If no, go to 3.1 (to analyze next pest)</p>	No	

Pathway 3		Involuntary entry with soil as a contaminant on footwear
<p>3.2 Is the pathway that is being considered a commodity of plants and plant products?</p> <p>If yes, go to 3.11, If no, go to 3.3</p>	No	
<p>3.3 Is the pathway that is being considered the natural spread of the pest? (see answer to question 1.32)</p> <p>If yes, go to 3.4, If no, go to 3.9</p>	No	

<p>3.9 Is the pathway that is being considered the entry with human travellers?</p> <p>If yes, possible measures: inspection of human travellers, their luggage, publicity to enhance public awareness on pest risks, fines or incentives. Treatments may also be possible, Go to 3.29</p> <p>If no, go to 3.10</p>	<p>Yes</p>	<p>If yes, possible measures: inspection of human travellers, their luggage, publicity to enhance public awareness on pest risks, fines or incentives. Treatments may also be possible.</p>
<p>3.30 Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest? List them.</p> <p>If yes, go to 3.31</p> <p>If no, go to 3.38</p>	<p>Yes</p>	<p>Inspection of human travellers, their luggage, publicity to enhance public awareness on pest risks, fines or incentives.</p>
<p>3.31 Does each of the individual measures identified reduce the risk to an acceptable level?</p> <p>If yes, go to 3.34</p> <p>If no, go to 3.32</p>	<p>Yes</p>	
<p>3.34 Estimate to what extent the measures (or combination of measures) being considered interfere with trade.</p> <p>Go to 3.35</p>		<p>The measure does not interfere with trade since this is not a commodity pathway.</p>
<p>3.35 Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.</p> <p>Go to 3.36</p>		<p>Historically in Europe inspection of travellers has never been recommended. Publicity to enhance public awareness seems feasible.</p> <p>Surveillance of the territory could monitor other species as well, and would be very efficient.</p>

<p>3.36 Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences?</p> <p>If yes, For pathway-initiated analysis, go to 3.39 For pest-initiated analysis, go to 3.38 If no, go to 3.37</p>	Yes	Internal surveillance and/or eradication campaign.
<p>3.39 Have all the pests been analyzed (for a pathway-initiated analysis)?</p> <p>If yes, go to 3.40, If no, go to 3.1 (to analyze next pest)</p>	Yes	
<p>3.40 For a pathway-initiated analysis, compare the measures appropriate for all the pests identified for the pathway that would qualify as quarantine pests, and select only those that provide phytosanitary security against all the pests.</p> <p>Go to 3.41</p>		
<p>3.41 Consider the relative importance of the pathways identified in the conclusion to the entry section of the pest risk assessment</p> <p>Go to 3.42</p>		<ul style="list-style-type: none"> - Soil/growing medium (with organic matters) as a commodity: low to medium risk in EU countries, no risk in non EU EPPO countries - Involuntary entry with soil as a contaminant on used machinery: medium risk, mainly in neighbouring countries of places where the plant occurs. - Involuntary entry with soil as a contaminant on used vehicles: medium risk. - Involuntary entry with soil as a contaminant on footwear: medium risk

<p>3.42All the measures or combination of measures identified as being appropriate for each pathway or for the commodity can be considered for inclusion in phytosanitary regulations in order to offer a choice of different measures to trading partners.</p> <p>Go to 3.43</p>		
<p>3.43In addition to the measure(s) selected to be applied by the exporting country, a phytosanitary certificate (PC) may be required for certain commodities. The PC is an attestation by the exporting country that the requirements of the importing country have been fulfilled. In certain circumstances, an additional declaration on the PC may be needed (see EPPO Standard PM 1/1(2): Use of phytosanitary certificates)</p> <p>Go to 3.44</p>		
<p>3.44. If there are no measures that reduce the risk for a pathway, or if the only effective measures unduly interfere with international trade (e.g. prohibition), are not cost-effective or have undesirable social or environmental consequences, the conclusion of the pest risk management stage may be that introduction cannot be prevented. In the case of pest with a high natural spread capacity, regional communication and collaboration is important.</p>		

<p>Conclusion of Pest Risk Management. Summarize the conclusions of the Pest Risk Management stage. List all potential management options and indicate their effectiveness. Uncertainties should be identified.</p>	<p><u>Soil/growing medium (with organic matters) as a commodity</u> Pest-free place of production Pest-free area Internal surveillance and/or eradication campaign</p> <p><u>Involuntary entry with soil as a contaminant on used machinery</u> Cleaning of machinery Internal surveillance and/or eradication campaign</p> <p><u>Involuntary entry with soil as a contaminant on used vehicles</u> Internal surveillance and/or eradication campaign</p> <p><u>Involuntary entry with soil as a contaminant on footwear</u> Publicity to enhance public awareness on pest risks Internal surveillance and/or eradication campaign</p>
--	--

Bibliography

Cabinet of Ministers Order No. 426 (2006) On Distribution Control Program of Giant Hogweed for the Period of 2006-2012

Holm B. (2005) Biology, distribution and control of invasive *Heracleum* species. Master thesis in Estonian Agricultural University.

Jahodová Š, Fröberg L, Pyšek P, Geltman D, Trybush S & Karp A (2007) Taxonomy, Identification, Genetic Relationship and Distribution of Large *Heracleum* Species in Europe (Chapter 1). In Pyšek P, Cock MJW, Nentwig W, Ravn HP (eds) (2007) Ecology and management of Giant Hogweed (*Heracleum mantegazzianum*). CAB International. P. 1-19.

Laiwins M, Gavrilova G (2003) *Heracleum sosnowskyi* in Latvia: sociology, ecology and distribution. *Latvijas Veģetācija* 7: 45-65.

Moravcová L, Pyšek P, Krinke L, Pergl J, Perglová I & Thompson K (2007) Seed Germination, Dispersal and Seed Bank in *Heracleum mantegazzianum* (Chapter 5) in Pyšek P, Cock MJW, Nentwig W, Ravn HP (eds) (2007) Ecology and management of Giant Hogweed (*Heracleum mantegazzianum*). CAB International. P. 74-91

Nielsen C, Ravn HP, Nentwig W & Wade M (eds.) (2005) The Giant Hogweed Best Practice Manual. Guidelines for the management and control of an invasive weed in Europe. - Forest and Landscape Denmark, Hoersholm, 44 pp.

http://www.giant-alien.dk/pdf/Giant_alien_uk.pdf

Oboļeviča D (2001) [Hogweed and its distribution in Latvia].

http://www.lva.gov.lv/daba/eng/biodiv/lauks_latvanis_e.htm

PPP Index

<http://www.ppp-index.de/> Last accessed on 2008-06-12.

Thiele J, Otte A (2007) Impact of *Heracleum mantegazzianum* on invaded vegetation and human activities. In Pyšek P, Cock MJW, Nentwig W, Ravn HP (eds) (2007) Ecology and management of Giant Hogweed (*Heracleum mantegazzianum*). CAB International. P. 144-156

Tkachenko KG (1989) Peculiarities and seed productivity in some *Heracleum* species grown in Leningrad area. *Rastitelnye Resursy* 1:52–61. [In Russian.]