



Finland's National
**STRATEGY ON INVASIVE
ALIEN SPECIES**



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Tiina Lausjärvi

Majju Lehtiniemi

Veikko Rinne

Terhi Rytteri

Jouni Tulonen

Ilmari Valovirta

Marcus Wikman

Layout:

Kirsti Pohjapelto

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FINLAND´S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES
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Alien species are organisms that have spread from their natural distribution range to a new area through human action, whether intentionally or unintentionally. In other words, an alien species has migrated over natural barriers to migration (such as a continent, a sea or a mountain range) with intentional or unintentional human assistance. Generally alien species adapt poorly to their new environment and are quickly destroyed. In some cases, however, alien species thrive in their new environment, establishing a permanent and propagating population. A few of these thrive remarkably well, so much so that they cause severe damage to indigenous species, ecosystems, crops, forestry or other areas of the economy and thus pose a serious threat. They may also cause significant financial damage by affecting human, animal or plant health or by decreasing the value of properties, or by causing social or aesthetic harmful impacts. Alien species that cause obvious harmful impacts are known as **invasive alien species**.

FINLAND'S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

FOREWORD



On 15 March 2012, the Government adopted a Resolution on the National Strategy on Invasive Alien Species. With the addition of an action plan and background material on invasive alien species in Finland, this marks the first time that such an extensive analysis of Finland's invasive alien species and means for combating them is being conducted, taking all possible perspectives into account.

Preparing Finland's National Strategy on Invasive Alien Species became necessary for a number of reasons. In recent years, invasive alien species have affected an increasing number of Finns and also the livelihoods of many. Numerous messages sent to the Ministry by private citizens reflect the great public concern for the hazards and damage already caused by some of these species. There is thus a call for a uniform and coherent national set of instructions, a strategy, for preventing or at least ameliorating the impacts of invasive alien species.

The Government Resolution was preceded by three years of pioneering preparation involving an extensive number of the finest Finnish experts in the field. The proposal for a National Strategy on Invasive Alien Species represented the efforts of at least 100 experts and contained suggestions for concrete measures to address these problems. The collecting of information in the course of preparing the Strategy proposal, such as identifying invasive alien species and charting the overall alien species situation in Finland, is in itself a valuable contribution to our national knowledge. We need to know which invasive alien species are al-

ready established in Finland, what their harmful impacts are and what we – the authorities, other actors, and private citizens – should do about this. The Strategy proposal provided an excellent foundation for the Government Resolution now adopted.

The environment for preparing the Strategy was favourable, also in terms of timing. The EU is preparing Community-wide legislation on this matter. Once this EU legislation is enacted, it will be extremely useful for Finland to have carefully considered and well-prepared groundwork already in place for implementing the requirements of EU legislation in meeting the challenges posed by alien species. Developing legislation on alien species also in Finland is a good way of minimising the harmful impacts of invasive alien species already established in Finland and of preventing the arrival of new invasive alien species. Improved co-ordination in the form of an expert and monitoring body is also a highly justifiable measure, as is the establishment of an 'alien species portal' to bring together available information on the topic in Finland.

Although we can already anticipate several trends related to invasive alien species, it is impossible to estimate all of the challenges that alien species will pose in the future. In addition to implementing the National Strategy on Invasive Alien Species, we must continuously monitor and improve our operations in the light of the most recent information available. We will need the authorities, other actors and private citizens to co-operate in this too.

A blue ink signature of Jari Koskinen.

Jari Koskinen
Minister of Agriculture and Forestry

FINLAND'S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

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FINLAND'S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

SUMMARY

Finland's National Strategy was adopted by a Government Resolution on 15 March 2012. Its leading idea is to prevent the damages and risks caused by invasive alien species to the Finnish nature, sustainable use of natural resources, livelihoods and well-being of the society and people. The National Strategy on Invasive Alien Species is based on a proposal prepared in collaboration between a broadly-based working group and experts, involving a total of more than 100 people. The background material for the Strategy and Action Plan were finalised on the basis of the Resolution and extensive round of comments.

Alien species have been imported by people both for commercial purposes and by accident. Intentional imports involve crops for cultivation and ornamentation, fish for aquaculture, and game for hunting and farming. Fish, reptiles, birds, mammals and invertebrates are imported as pets.

The migration of alien species from one area to another on means of transport, with raw materials and with equipment has become more common in the past decades. Alien species may migrate for instance with untreated timber or wood packages, or in the ballast water of ships or attached to their hulls. Unintentional imports mostly involve seeds, eggs (of invertebrates), diseases, parasites or species migrating with other species (epibionts). In recent years, the level of unintentional imports of alien species has risen compared with intentional releasing into the natural environment. All the alien species in the Baltic Sea have been introduced unintentionally.

The objective of Finland's National Strategy on Invasive Alien Species is to minimise the threat and damage caused by invasive alien species, both those already present in Finland and the potential ones. The measures proposed in the Strategy ad-

dress invasive alien species introduced to Finland by human action, intentionally or unintentionally, which are spreading uncontrolledly and cause harmful impacts as they do so. The purpose of the Strategy is to prevent the introduction to Finland of new invasive alien species that spread uncontrolledly.

Invasive alien species

Invasive alien species and potentially or locally harmful alien species have been identified from among all alien species in Finland. The analyses describes the situation as at the beginning of 2011, but the invasive alien species situation may change rapidly, particularly in the absence of restrictive measures.

A total of 157 invasive alien species permanently established in Finland which cause clearly identifiable, direct or indirect damage have been identified. A significant percentage of these species (100 species) are alien agricultural and forestry species. Some of them may also constitute a threat to the indigenous natural environment. Of the remaining species, 5 occur in the territorial waters of Finland in the Baltic Sea, 5 in inland waterways, 6 are land vertebrates, 24 are plant species and 9 are indoor pests.

Moreover, 123 potentially or locally harmful alien species have been identified in Finland; these are established alien species that may cause direct or indirect harm. About one third of these are agricultural and forestry-related alien species. These potentially or locally harmful alien species include species already occurring in Finland and species found to be harmful outside Finland. The majority of the potentially or locally harmful alien species are already established in Finland.

Particularly harmful alien species were analysed into a separate category. These include dangerous plant pests or quarantined species (37), the import and spreading of which is prohibited by directive in all EU Member States. Hogweeds, the Japanese rose, crayfish plague, the Spanish slug and the [American] mink have been declared particularly harmful alien species in Finland. For these species at least, immediate decisive action must be taken to eradicate them, or at the very least to prevent their spreading and to mitigate their harmful impacts.

The lists of alien species will be amended as new information is gained.

Measures concerning invasive alien species

Mitigation of the harmful impacts of invasive alien species requires a division of responsibilities between actors and a wide range of measures. The Action Plan for Finland's National Strategy on Invasive Alien Species puts forward 16 measures, 12 against all invasive alien species and 4 against specific groups of species.

To ensure that invasive alien species occurring in Finland and their harmful impacts are identified and combated with a comprehensive range of measures. The Strategy further proposes that a system be established in Finland by 2020 whereby the harmful impacts of invasive alien species can be controlled and the entry into Finland of new such species can be prevented.

Although Finnish legislation contains some provisions pertaining to the reduction of the harmful impacts of invasive alien species, the legislation in this area is not comprehensive. The Action Plan for the Strategy therefore includes a measure implementing legislative reform, either by amending existing legislation or by enacting a new Act on invasive alien species. The Strategy identifies problem points in legislation such as the absence of control of invasive alien species, the less than comprehensive coverage of official responsibilities, the lack of authority for officials to intervene in eradicating invasive alien species, and the absence of an obligation of notification of occurrences of invasive alien species. Legislation also does not comprehensively regulate the sale, offering for sale or spreading of invasive alien species; derogations from the principles of sustainable use in the reduction of invasive alien species; notifi-

cation obligations regarding stocking of fish and crayfish; or the import and use of bees.

An important tool in combating invasive alien species is increasing public awareness of them and of actions that can be taken against them. Publicity and training measures concerning invasive alien species will be introduced jointly by various actors. Volunteer work by citizens to combat invasive alien species will be encouraged.

The Action Plan includes a measure proposing that an Invasive Alien Species Body be set up. The duties of this Body would include monitoring and co-ordination of actions against invasive alien species, supporting the authorities and managing co-ordination towards the EU.

Various organisations in Finland have information-collecting procedures on species sightings for their own purposes, but as they stand they do not cater to the national invasive alien species management effort. The Action Plan includes a measure proposing the setting up of an invasive alien species portal for compiling, distributing and leveraging information on invasive alien species. Establishing a functioning early warning system and invasive alien species monitoring is crucial to the effective combating of invasive alien species.

A functioning risk assessment system is needed to leverage monitoring and research data and to channel it into legislation, monitoring and publicity. The target is to improve the capacity for evaluating the risk posed by alien species and risk management measures urgently if necessary. The Action Plan includes a measure proposing the setting up of a national risk assessment system on invasive alien species.

The Action Plan also includes measures proposing increased research on invasive alien species and the targeting of research so as to support risk assessment and risk management efforts.

Legislative amendments and allocation of sufficient resources will help establish potential for preventing the entry of invasive alien species into the country and for rapid deployment of measures against invasive alien species that have managed to enter the country. One of the measures in the Action Plan involves exploring new funding sources for actions against invasive alien species and how to implement the 'polluter pays' principle.

The Finnish government must ensure that the transborder migration of invasive alien species through Finland can be prevented. Finland must contribute to international efforts to combat the harmful impacts of invasive alien species.

Finland's National Strategy on Invasive Alien Species sets the target of eradicating hogweeds from Finland within the next 10–20 years. The hogweed eradication project will form a national pilot project, setting a benchmark for combating other species.

Citizens play an important role in the control of the invasive alien species problem. Responsible keeping of pets and appropriate disposal of garden waste can help prevent the spreading of alien species. Citizens and NGOs have a vital role to play in combating invasive alien species, and this requires continuous encouragement.

Threat from alien species

Worldwide, invasive alien species constitute one of the leading threats to biodiversity, second only to the destruction and fragmentation of entire habitats. In Finland too, invasive alien species are a threat to the natural environment. According to a report on endangered species in Finland (2010), alien species have affected the endangered status of certain species in our country. There are also known cases where the structure and function of entire ecosystems have changed substantially due to the arrival of an alien species.

Invasive alien species also have economic, social and health impacts. In 2001, it was estimated that the annual damage caused by invasive alien species (including the harmful impacts and damage caused, compensation for the damage, and the costs of combating measures) worldwide exceed USD 1,400 billion (EUR 1,054 billion), equivalent today (2010) to about 2% to 3% of the combined GDP of the world. In Europe, the annual costs of invasive alien species have been estimated to be at least EUR 12.5 billion unless combated or restricted. The majority (about 80% to 90%) of these costs are incurred through the harm and damage caused by invasive alien species and compensation thereof, including harm to agriculture, forestry and fisheries, infrastructure damage and harmful impacts on human health.

In Finland too, invasive alien species are known to cause significant losses in quantity and quality

in production (crops and catches) and costs related to the damage caused in compensation and repairs. One of the most significant harmful impacts caused by an invasive alien species in Finland is the collapse of the catch of noble crayfish because of crayfish plague, a disease of American origin. The losses caused by this were on the order of EUR 10 million per year throughout the 20th century, calculated at present producer prices.

Regular costs are being incurred in Finland for instance through plant and animal inspections related to alien species, prevention measures against invasive alien species such as hogweeds, the Himalayan balsam and the Japanese rose, and hunting and trapping of small predators spreading to Finland. Even the costs of disease and pest control, prevention and monitoring amount to several million euros per year in Finland. In 2010, the City of Helsinki spent about EUR 0.5 million on limiting the population of wild rabbits in the city and on damage prevention. It is estimated that at least tens of millions of euros are spent on measures related to the control of invasive alien species in Finland every year. Overall, the overall economic losses caused by invasive alien species in Finland are very probably on the order of tens if not hundreds of millions of euros per year.

The precautionary principle is a tried and tested approach to invasive alien species; correcting their damage after the fact is very expensive and often almost impossible. Anticipatory prevention can stop harmful impacts from occurring in the first place or can significantly limit them.

Addressing the invasive alien species problem, particularly with anticipatory prevention, is an important and necessary investment that will benefit the natural environment, the national economy and society at large. Finland's National Strategy on Invasive Alien Species provides a foundation for addressing the hazards and harmful impacts of invasive alien species. The measures proposed in the Strategy will reduce the probability of the most harmful invasive alien species spreading to Finland.

TARGET TIMETABLES FOR IMPLEMENTING THE MEASURES

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2030
1. Develop legislation	Development preparation									
2. Set up an expert and monitoring body (for IAS)	Appointment preparation	Body in operation								
3. Publicity and training	Publicity plan			Training and campaigns continue						
4. Invasive alien species portal	Portal setup			Portal in use						
5.1. Early warning system		System development			System in use					
5.2. Monitoring	Intensive monitoring				Monitoring focusing on changes					
6. Risk assessment system	Organisation, model development, initial prioritisations				Risk assessment system in use					
7. Research	Setting up a research programme and preparing a plant protection research strategy					Research on impacts continues				
8. Prepare for preventing entry	Tools for import, distribution and sales restrictions and for monitoring of pathways					Systems in use				
9. Volunteer action	Encouraging of actors and support for NGOs									
10. Explore and develop funding mechanisms	Alternative sources exploration			Leveraging new funding mechanisms						
11. Ensure that no invasive alien species spread from Finland		Measures against designated species								
12. International measures	Address invasive alien species in international co-operation									
13.–15. Targeted measures	Implementation of targeted measures against invasive alien species in the Baltic Sea and inland waterways and against invasive alien land vertebrates and plants									
16. Eradicate hogweeds	Eradication project setup, resourcing, organisation and execution								Eradicated	
More detailed timetables for each measure are given in the text.										



GOVERNMENT RESOLUTION ON FINLAND'S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

STRATEGY

On 15 March 2012, the government adopted a Resolution on Finland's National Strategy on Invasive Alien Species at the proposal of the Ministry of Agriculture and Forestry. The Government Resolution presents approaches and policies that will be used to minimise the threat from invasive alien species and to eliminate or reduce the harmful impacts of these species. The Government Resolution also designates the authorities responsible and provides for an impact assessment.

The Government Resolution on the National Strategy on Invasive Alien Species was prepared by the Ministry of Agriculture and Forestry on the basis of the proposal returned by the broad-based invasive alien species working group appointed by the Ministry. The proposal was submitted to Sirkka-Liisa Anttila, Minister of Agriculture and Forestry, on 30 March 2011. The preparation of the proposal involved citizens' consultation in February 2011 and an extensive circulation for comment in May 2011. Some 100 responses were received from ordinary citizens, and 78 statements were returned on the strategy proposal. The proposal Strategy was revised and further specified on the basis of the feedback from the online polling and the statements received. The National Strategy on Invasive Alien Species touches on several administrative sectors.

INTRODUCTION

The Government Programme of Prime Minister Jyrki Katainen's Government notes: "The prevention of the spread of invasive alien species will be

enhanced on the basis of the national strategy for invasive alien species by improving the monitoring and reporting of observations."

On 3 May 2011, the European Commission issued a Communication entitled *Our life insurance, our natural capital: an EU biodiversity strategy to 2020* (COM(2011)244 final). Known as the EU Biodiversity Strategy, this document specifies under Target 5: "By 2020, Invasive Alien Species and their pathways are identified and prioritised, priority species are controlled or eradicated, and pathways are managed to prevent the introduction and establishment of new invasive alien species."

In December 2008, the European Commission adopted the Communication *Towards an EU Strategy on Invasive Species*. This was the first step on the path to an EU strategy for addressing the problems caused by invasive alien species. The Commission is now preparing a proposal for EU-wide legislation concerning the combating of invasive alien species; this is scheduled for completion by the end of 2012.

The Strategic Plan for Biodiversity adopted by the tenth meeting (October 2010) of the Conference of the Parties of the Convention on Biological Diversity states under Target 9: "By 2020, invasive alien species and pathways will be identified and prioritised, priority species will be controlled or eradicated, and measures will be in place to manage pathways to prevent their introduction and establishment."

Finland is committed to combating invasive alien species and their harmful impacts nationally, at the EU level and internationally. Finland's Na-

tional Strategy on Invasive Alien Species provides the potential and the means for combating invasive alien species and their threats and risks at the national level. It also fulfils international and EU obligations in this field. Moreover, it implements the Government Resolution adopted in 2012 concerning preservation and sustainable use of the biodiversity of Finnish nature.

Threats and risks caused by invasive alien species

Alien species are organisms that have spread from their natural distribution range to a new area through human action, whether intentionally or unintentionally. In other words, an alien species has migrated over natural barriers to migration (such as a continent, a sea or a mountain range) with intentional or unintentional human assistance. Generally, alien species adapt poorly to their new environment and are quickly destroyed. In some cases, however, alien species thrive in their new environment, establishing a permanent and propagating population. A few of these thrive remarkably well, so much so that they cause severe damage to indigenous species, ecosystems, crops, forestry or other areas of the economy and thus pose a serious threat. They may also cause significant financial damage by affecting human, animal or plant health or by decreasing the value of properties, or by causing socially or aesthetically harmful impacts. Alien species that cause obvious harmful impacts are known as **invasive alien species**.

Worldwide, invasive alien species constitute one of the leading **threats to biodiversity**, second only to the destruction and fragmentation of entire habitats. The spread of invasive alien species decreases biodiversity on average, even if it may locally or regionally increase the number of species present.

Invasive alien species present a multitude of harmful impacts on biodiversity, ecosystem functioning and the ecosystem services thereby maintained. Alien species may threaten indigenous species by competing with them for the same resources, by predation, by spreading diseases or parasites, or by cross-breeding with these species in the wild. Alien species are also known to have changed the structure of food chains and have affected the functioning of entire ecosystems. The harmful impact of invasive alien species on the natural environment, biodiversity and ecosystem

services may thus have direct and indirect adverse effects on human well-being too.

Invasive alien species cause harmful **social impacts** and substantial financial losses to a variety of actors. Many invasive alien species are major pests to the agriculture and forestry industries. Fishing and fish farming may also suffer from the spreading of invasive alien species; alien species may also pose a health hazard or function as disease carriers. Invasive alien species cause problems for recreational activities and tourism too. They also may compromise the functioning of the basic structures of society.

Invasive alien species cause significant financial costs worldwide. In 2001, it was estimated that the annual **damage** caused by invasive alien species worldwide exceed USD 1,400 billion (EUR 1,054 billion), equivalent today to 2% to 3% of the combined global GDP. Of the 11,000 or so alien species found in Europe, probably 10% to 15% cause some kind of harmful ecological or economical impacts. Even at a cautious estimate, the value of the damage caused by these invasive alien species amounts to at least EUR 12.5 billion per year. The majority (about 80% to 90%) of these costs are incurred through the harm and damage caused by invasive alien species and compensation thereof, including harm to agriculture, forestry and fisheries, infrastructure damage and harmful impacts on human health.

No overall study of the costs caused by invasive alien species in Finland has been made, but they are known to cause significant losses in quantity and quality in production (crops and catches). Regular costs are being incurred in Finland, for instance through plant and animal inspections related to alien species, prevention measures against invasive alien species such as hogweeds, Himalayan balsam and Japanese rose, and hunting and trapping of small predators spreading to Finland. Even the costs of disease and pest control, prevention and monitoring amount to several million euros per year in Finland.

The impacts of invasive alien species may be detected in several different areas of society at once. The potentially most vulnerable areas in Finland are those of substantial importance to the national economy, for instance in forestry. A situation causing devastating economic losses would emerge if one particular invasive alien species disastrous for the forest industry – the pine wood

nematode (*Bursaphelenchus xylophilus*) – were to spread rapidly in Finland's forests.

GOAL OF THE NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

The goal of the strategy is to minimise the risk of invasive alien species already established in Finland and with a probability of being introduced to Finland, and to ensure that invasive alien species occurring in Finland and their harmful impacts are identified and combated with a comprehensive range of measures. A system will be established in Finland by 2020 whereby the harmful impacts of invasive alien species can be controlled and the entry into Finland of new such species can be prevented.

To attain this goal, the strategy incorporates the following practical measures:

- 1) to increase awareness among citizens of the combating of invasive alien species and to encourage them to take action,
- 2) to determine the responsibilities and actions of officials and other actors in limiting the damage caused by invasive alien species,
- 3) to prepare for new invasive alien species threats caused by climate change and other changes in the operating environment, and
- 4) to improve and promote cooperation in the eradication of damage by invasive alien species nationally, at the EU level and internationally.

APPROACH AND IMPLEMENTATION OF THE NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

It is considered justified for the implementing of Finland's National Strategy on Invasive Alien Species that measures be taken to minimise the threat and harmful impact of invasive alien species in Finland. Measures will be taken applying an internationally approved three-tier approach and relevant actions.

The three-tier approach involves

- 1) preventing and combating
Principle: The risk of new invasive alien species arriving will be minimised or eliminated. All pathways and both intentional and unintentional introduction will be taken into account. The further spreading of invasive alien species already found in the country and their harmful impacts will be prevented or minimised.
- 2) early detection and eradication
Principle: Invasive alien species that have arrived in the country will be identified and eradicated before they can establish a permanent population.
- 3) prevention of spreading and continuous long-term limitation measures
Principle: Invasive alien species already established in the country will be prevented from spreading more widely and from causing more widespread harmful impacts.

The three-tier approach covers both established and arriving invasive alien species.

It is known that prevention is generally much more cost-effective and environmentally friendly than corrective action. However, in a case where an invasive alien species has already entered an area, early detection and rapid eradication are the most cost-effective ways of preventing it from establishing itself and spreading further. If an invasive alien species proves impossible to eradicate, measures to combat it and prevent its spreading must be undertaken, or else provision must be made to adapt to the presence of the species.

MEANS FOR PREVENTING AND MINIMISING THE THREATS AND HARMFUL IMPACTS OF INVASIVE ALIEN SPECIES

The following is a discussion of practical means available for preventing and minimising the threats and harmful impacts of invasive alien species.

Develop legislation

The purpose of developing the Finnish legislation is to create a legal basis for actions and means for rapid deployment of prevention measures upon the arrival of a new, suspected invasive alien species and for the limiting or preventing of the spreading of an invasive alien species already established in the country. Legislation will also clarify the responsibilities of and relationships between various actors in combating invasive alien species. This will make practical efforts more efficient while enabling further development of actions to minimise the risks of invasive alien species and to mitigate their harmful impacts. The target is to amend and enact legislation concerning the management of, and the limitation of risks caused by, invasive alien species so that it will be comprehensive and up to date.

Legislation will be harmonised either by amending existing legislation or, if necessary, by enacting a special Act on invasive alien species.

Legislative means and solutions concerning invasive alien species are being prepared by the EU; it is estimated that these will be completed in late 2012. The EU legislation will have a significant impact on the development of national legislation on alien species.

A probable solution concerning invasive alien species to be enacted as binding upon EU Member States is the introduction of an early warning system. Such a system can provide up-to-date information on the alien species situation while enabling the early detection of the arrival of new alien species. At the same time, it will become possible to prevent or combat harmful impacts with appropriate and timely measures. The system will include an alert function designed to detect the entry of new invasive alien species as early as possible. A well-functioning early warning system will notify the authorities of the occurrence of an invasive alien species very quickly. The system will be introduced as required by the EU.

Legislation concerning alien species is intended to be developed by a dedicated working group. This effort will be based on identified shortcomings in the national legislation on invasive alien species and on legislative solutions to be adopted by the EU. The legislative development will need to be based on what is known as the prudence principle, and also on the polluter-pays principle as far as possible. It will not be feasible to launch

national preparation of legislation in Finland until the content and form of the EU legislation on alien species have been established.

Improving communications

One of the crucial pillars in action to be taken against invasive alien species is communications: the target is to employ publicity, training and guidelines to raise awareness of invasive alien species among key actors, including citizens. Increasing publicity and training on invasive alien species will raise awareness of the related risks, which will contribute to the prevention of harmful impacts and support the implementation of restrictions. Publicity and training can highlight information on the new invasive alien species that may spread to Finland due to increased travel, the harmful impacts of those species and the increased risks of invasive alien species already established in Finland. Communications will also increase public awareness of the means required to combat invasive alien species and understanding of the necessity of robust action.

The relevant and up-to-date information needed in Finland for publicity, risk assessment, monitoring and combating measures related to invasive alien species must be available in one location. Known as the alien species portal, this service will also be able to receive and distribute information on invasive alien species. Information will also be available on the location and extent of species populations and of combating measures taken nationwide, so that combating measures can be implemented cost-efficiently in the right place at the right time. The portal must be set up in connection with systems that already exist and are under development, insofar as this is possible.

Organisation-specific targeting

Official coordination is required in the implementation of the alien species strategy in Finland. This would facilitate coordinated discussion of issues related to alien species, such as the drafting of proposed measures to combat risks and harmful impacts; the launching of rapid-response action; the commissioning and monitoring of risk assessments; the maintaining, updating and confirming of alien species lists, including lists of which pets may be imported; development of innovative funding; and coordination and promotion of general matters involving alien species. Alien species

coordination is also intended to manage the monitoring and progress of action addressing alien species. Monitoring is needed to follow changes in the distribution and harmfulness of alien species, the effectiveness of combating measures, and the implementation of the National Strategy on Invasive Alien Species. The purpose of alien species coordination is to simplify the processing of alien species matters and the formulation of consistent policies in EU-level negotiations, for instance, and also to support the development of actions against alien species. The aim is to create a more organised and stable network for dealing with issues related to invasive alien species.

Risk assessment and risk assessment development are crucial for the control of invasive alien species. This would initially be undertaken on a sector-specific basis and would support preparations for the harmful impacts of alien species and the anticipation of combating measures. The purpose of risk assessment is to identify and describe the hazards related to the entry into the country of specific invasive alien species and to assess the probabilities of their establishment and spreading. The assessment also involves estimating how harmful these species are and what measures are available to combat them. Risk assessment and the evaluation of measures to be taken against risks help choose the risk management measures that are the best for society at large. Risk assessment facilitates the allocation of existing resources to controlling the species which cause the greatest risks or which can be cost-effectively controlled, and also to the most efficient management measures (including prevention) for each species, helping guide the choices of individual actors (e.g. importers) and supporting preparedness planning related to specific species or functions.

The practical implementation of risk assessment will be steered through performance guidance and, if possible, through cooperation between various bodies, for instance.

Other means

In addition to the above, it is important to increase alien species research in order to minimise the threats and harmful impacts of invasive alien species, to develop funding mechanisms addressing invasive alien species, including mechanisms taking into account the responsibility of the private sector in this respect, and to create preparedness for preventing the introduction into the

country of alien species, such as by drawing up preparedness plans. Local eradication campaigns undertaken by volunteers can be organised more cost-effectively and implemented more affordably through NGOs than solely through action taken by the authorities. Species-specific combating actions are also possible. These are very different from one another, depending on whether they concern invasive alien species in the Baltic Sea or in an agricultural and forestry environment, for instance.

OFFICIAL RESPONSIBILITIES IN FINLAND

Currently, the Ministry of Agriculture and Forestry is responsible for alien species in agriculture and forestry, game management and fisheries, while the Ministry of the Environment is responsible for alien species that belong within the purview of the Nature Conservation Act. The Ministry of Transport and Communications coordinates invasive alien species issues related to road management, transport routes and shipping. The Ministry for Foreign Affairs is responsible for invasive alien species issues related to development cooperation projects.

The Ministry of Agriculture and Forestry coordinates national measures against invasive alien species. The Ministry is the contact authority for EU alien species issues and in other international contexts as necessary.

Official responsibilities include legislation development, implementation and monitoring.

Collaboration with municipalities and with environmental, health and other authorities in local government concerning the combating of invasive alien species will be continued.

Table 1. Official responsibilities concerning alien species in Finland.

Ministry of Agriculture and Forestry
Overall coordination
Principal responsibility for alien species in agriculture and forestry, and in fisheries and game management
Contact authority (Focal Point) for EU-level alien species issues
Performance management (MTT Agrifood Research Finland, Metsähallitus, Finnish Forest Research Institute Metla, Forestry Development Centre Tapio, Finnish Forestry Centre, Finnish Game and Fisheries Research Institute, Finnish Game Management Centre, Finnish Food Safety Authority Evira, Centres for Economic Development, Transport and the Environment)
Ministry of the Environment
Responsibility for alien species pursuant to the Nature Conservation Act
Performance management (Finnish Environment Institute, Metsähallitus, Centres for Economic Development, Transport and the Environment)
Ministry of Transport and Communications
Alien species issues related to transport route management, traffic and transport (shipping, railways, roads)
Performance management (Centres for Economic Development, Transport and the Environment through the Finnish Transport Agency)
Ministry for Foreign Affairs
Responsibility for invasive alien species issues related to development cooperation projects

IMPACTS OF THE STRATEGY

General

The objective of Finland’s National Strategy on Invasive Alien Species is to reduce the damages and risks caused by invasive species to the Finnish natural environment and socio-economic well-being. Preventing the spreading of invasive alien species is important for the avoidance of major economic losses and for securing biodiversity and ecosystem functionality in the natural environment in order to safeguard the ecosystem services provided.

Biodiversity is crucial for the functioning of ecosystems, and ecosystem services are important and economically valuable for the well-being of society at large. The harmful impact of invasive alien species on the natural environment, biodiversity and ecosystem services may thus have direct and indirect adverse effects on human well-being too.

Environmental impacts

Finland’s National Strategy on Invasive Alien Species, if implemented appropriately and comprehensively, will improve the prevention of the

harmful environmental impacts of invasive alien species in the future.

The principal objective of the strategy is to prevent invasive alien species from being introduced to and established in Finland. If enforced appropriately, this objective will reduce though not completely eliminate the likelihood of harmful impacts of invasive alien species.

Implementing the strategy may also go some way towards limiting the harmful impacts of already established species in Finland’s natural environment. National measures may be taken to prevent the spreading of species now known to be detrimental to biodiversity, such as Canadian waterweed and hogweeds, to new areas. The strategy involves motivating the game management authorities, for instance, through small predator campaigns and hunters by distributing information concerning the hunting and trapping of the widespread American mink and raccoon dog as a method for game bird management, and the development of more effective trapping equipment and methods for eradicating invasive alien species. This will allow a systematic approach to reducing the harmful impacts of these invasive alien species in areas that are important for biological diversity. Implementing the strategy may even have local landscape impacts, since the eradica-

tion of Japanese rose from sandy beaches, for instance, will restore the original landscape.

Some alien species, however, have already established a permanent population in Finland, and it will not be technically or financially possible to eradicate them. This is particularly true of the alien species in the Baltic Sea. Some alien species such as the white-tailed deer are regarded as valued game animals, and the population of this species is being managed by the game management authorities. It is not considered feasible to attempt to eradicate such species. Thus, the strategy, even if implemented in the broadest possible way, cannot result in a return to the status quo before the introduction of alien species to Finland. By extension, implementation of the strategy is expected not so much to change Finland's current natural environment as to prevent further loss of biodiversity and weakening of ecosystems in the future.

The strategy will increase the preparedness to react to changing circumstances and may thus facilitate intervention in situations where an alien species becomes invasive as circumstances change. This may be relevant as a component of our strategy of adaptation to climate change.

Financial impacts and impacts on business

Generally, both costs and benefits will be incurred from measures taken under the strategy.

The costs will include:

- costs of prevention (communications, warning systems, monitoring, risk assessment),
- costs of rapid-response prevention measures (planning, maintaining response readiness, targeted prevention actions),
- long-term changes in the maintenance of transport routes,
- costs of damage limitation, control and repairs,
- general costs of alien species management (development of alien species policy, administration costs, coordination, hearings),
- research costs,
- costs of volunteer action,
- costs caused by invasive alien species (actual and potential), including for instance the costs of adaptation in business operations and lost financial gain, and
- costs of monitoring and other information-gathering.

The benefits will include:

- reduction of costs caused by alien species,
- financial benefits from using alien species (e.g. game species), and
- financial benefits of operations that also unintentionally spread invasive alien species.

No comprehensive estimate of the costs of damage caused by invasive alien species has been made in Finland. For instance, the costs of research, prevention, eradication and monitoring of diseases and pests affecting cultivated plants amount to tens of millions of euros per year. Such costs include the prevention of and the damage caused by wild oat (EUR 10 to 30 million per year), combating hogweeds (EUR 2.5 million), combating wild rabbit (EUR 0.5 million annual cost to the City of Helsinki) and financial losses caused by the collapse of the noble crayfish catch because of the crayfish plague (EUR 10 million per year).

It has been noted, for instance in connection with the preparation of the EU Strategy on Invasive Alien Species, that the resources required for prevention of invasive alien species are considerably lower than the costs incurred through the harmful impacts of same. A study conducted in the UK indicates that the eradication of invasive alien species that have already established themselves with a widespread presence is 10 to 100 times more expensive than eradication at an early stage.

The implementation of the EU Strategy on Invasive Alien Species or EU legislation on alien species is estimated to lead to annual costs amounting to EUR 40 to 190 million at the EU level and for the Member States, the cost level depending on the content and coverage of the strategy. These costs, however, are only a fraction of the estimated financial damages caused by invasive alien species (EUR 12.5 billion per year).

The pine wood nematode contingency plan (2011) contains the estimated costs of combating that pest. If a single occurrence of pine wood nematode were to be discovered in a forest in Finland, the forest would be felled in a 3 km radius around the site. The costs incurred by central government in surveying and monitoring would be EUR 4.5 million in the first year and about EUR 115,000 per year for the next 15 years. The costs incurred by local combating measures (felling, clearing, transportation, gathering and burning felling waste) would be between EUR 1.6 and 6.4 million, depending on the site. Moreover, central

government would be obliged to pay forest owners EUR 4 to 13 million in compensation.

The implementation of Finland's National Strategy on Invasive Alien Species may require recommendations, limitations or even bans being imposed on the sale of invasive alien species such as ornamental plants. This may lead to a need to find new options to replace these invasive alien plants and to allocate research resources to this. Companies will sustain adjustment costs and direct financial losses.

The objective of the National Strategy on Invasive Alien Species is to minimise the financial losses and risks caused by invasive alien species at a moderate cost level. The costs caused by invasive alien species do not substantially affect those actors who benefit from alien species or whose operations increase the risk of invasive alien species being accidentally introduced to Finland.

Impacts on central government finances

Estimates of the costs caused by alien species have been made in the course of the preparation of the proposal for Finland's National Strategy on Invasive Alien Species on the basis of a survey circulated among various authorities and actors in 2010 and of expert evaluations. It was estimated that in 2010, invasive alien species cost various authorities and certain NGOs, producers and recreation users somewhere between EUR 28 and 51 million. Of this amount, about EUR 6 to 10 million per year was sustained by institutions that come under central government finances (including the Finnish Food Safety Authority Evira, the Finnish Transport Safety Agency, the Finnish Environment Institute, Metsähallitus, the Finnish Forest Research Institute and the University of Helsinki). Ongoing costs caused by alien species include the costs of preventing, eradicating and monitoring diseases and pests that affect cultivated plants, which today amount to several million euros per year. Local authorities and Centres for Economic Development, Transport and the Environment are estimated to incur EUR 1.2 million and 0.45 million, respectively, in annual costs.

The impact of the strategy on central government finances will initially be that funds will need to be allocated within administrative sectors to the implementation of the strategy.

The funding need of the Ministry of Agriculture and Forestry concerns expert consultation regarding alien species within the spending limits of the Ministry's administrative sector. The risk assessment procedure being developed at the Finnish Food Safety Authority Evira is expected to tie up two person-years' worth of personnel resources.

The funding need of the Ministry of the Environment has to do with the setting up and maintaining of the 'alien species portal'. Its implementation costs depend on how well synergy benefits with existing systems can be leveraged in broad-based cooperation. Upkeep of the portal may require reallocation of personnel resources through performance negotiations.

The strategy is being implemented by reallocating existing resources within administrative sectors. The strategy is being implemented within the spending limits of state government finances, the state budget and the effectiveness and productivity programme.

Current estimates indicate that it will be possible to draw on EU funding in the implementation of the strategy, such as rural development funding or Life+ funding. Combating invasive alien species could be incorporated in the Multiannual Financial Framework for the Common Agricultural Policy for 2014–2020, for instance as a special project-based measure. The Life+ funding instrument has already been leveraged in culling small predators, for instance, and similar projects could continue to be run. Alien species research could also be brought under EU research funding.

Social impacts

Combating invasive alien species and their spreading helps safeguard the functioning of ecosystems and the ecosystem services they generate. Ecosystem services important for the well-being of society at large include diverse use of the natural environment for recreation, which affects human well-being. The spreading of Canadian waterweed and Japanese rose, for instance, not only causes environmental changes but also adversely affects the use of the sea shore and inland waterways for recreation. A large stand of hogweed may prevent recreational use such as fishing and walking along rivers, and in heritage landscapes it may be considered a visual detriment as well. Invasive alien species may have an indirect impact

on tourism by weakening the recreation potential of certain areas. Implementing the strategy will help preserve diverse recreational opportunities in the natural environment.

Certain alien species have harmful impacts on human or animal health. Alien species cannot in and of themselves be considered a disease threat; but their indirect harmful impact should be anticipated.

MONITORING AND MIDTERM EVALUATION OF THE GOVERNMENT RESOLUTION

The implementation of this Government Resolution will be monitored regularly as part of the general monitoring of the work of the government and the ministries. Attainment of the goals presented in the Resolution will be monitored and evaluated for instance in connection with alien species coordination and in the context of the Government Resolution and National Strategy concerning biological diversity. New measures will be proposed as and when necessary. It is proposed that the interim evaluation of the strategy be carried out during 2016.

The most significant uncertainties with regard to the implementation of the strategy have to do with the nature of the alien species problem itself, issues of resources in implementing the strategy, and putting the measures into practice.

IMPLEMENTATION

Implementation of the strategy and related measures is the responsibility of several authorities and administrative sectors, and other actors too. The strategy is being implemented in administrative cooperation between various interest groups. The aim is for Finland's National Strategy on Invasive Alien Species to be adopted and incorporated in the operations, strategies and programmes of the various administrative sectors and of regional actors such as the Centres for Economic Development, Transport and the Environment, the Regional Councils and local authorities. All of the measures will be coordinated by the Ministry of Agriculture and Forestry.

Limitations to the implementation of the strategy

Finland's National Strategy on Invasive Alien Species addresses alien species observed in Finland that have, with some exceptions, been introduced to the country since 1850. The choice of the cut-off point was determined by the availability of reliable history data. The issue of alien species that might be introduced to Finland or might become invasive for instance because of changes in the operating environment is also addressed in the strategy. The implementation perspective of the strategy extends to 2030.

Procedures relating to the combating of animal diseases are not addressed in the strategy, because these are provided for in EU and national legislation on animal diseases. Agents causing exotic animal diseases, including zoonotic diseases and the harmful impacts thereof are not addressed in the strategy.

Diseases and pests affecting fish in aquaculture are not addressed in the strategy, nor are new species to be potentially introduced in fish farming. These issues are largely addressed by national and international legislation and procedures pertaining to fish farming.

Genetically modified organisms (GMO) were also excluded from the scope of the strategy, because there is already a national administration procedure and national regulations in place for them.



Himalayan balsam (*Impatiens glandulifera*)

PHOTO: TERHI RYTTÄRI



FINLAND'S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

BACKGROUND

THREAT FROM ALIEN SPECIES

Threat to biodiversity and ecosystem services

Worldwide, invasive alien species constitute one of the leading threats to biodiversity, second only to the destruction and fragmentation of entire habitats. Studies show that as many as 480,000 species have been introduced and spread into alien environments globally, and invasive alien species are known to be the most significant single contributing factor in species extinction worldwide. The spread of invasive alien species decreases biodiversity on average, even if it may locally or regionally increase the number of species present.

The first comprehensive list of invasive alien species in Europe was compiled in the DAISIE project in 2008.¹ This list contains more than 11,000 alien species. Most established alien species in Europe still have a relatively limited range, and as a result only a small percentage of these species have proliferated to such an extent as to be considered harmful. However, as the risk of the spreading of alien species increases and in the ab-

sence of effective methods to combat them, both at the EU level and nationally, it is highly likely that the number of invasive alien species and the damage caused by them will grow in the future. Of the 11,000 alien species found in the EU, 59% are terrestrial plants, 24% are terrestrial invertebrates, 10% are marine species, 4% are inland waterway species and 3% are terrestrial vertebrates.

Invasive alien species present a multitude of harmful impacts on biodiversity, ecosystem functioning and the ecosystem services thereby maintained.² Alien species may threaten indigenous species by competing with them for the same resources, by predation, by spreading diseases or parasites, or by cross-breeding with these species in the wild. For instance, crayfish plague (*Aphanomyces astaci*) of American origin, having spread into Finland's inland waterways, has largely destroyed our original population of noble crayfish (*Astacus astacus*). Similarly, the [American] mink (*Mustela vison*) and raccoon dog (*Nyctereutes procyonoides*), small predators alien to Finland's natural environment, cause considerable damage to waterfowl broods in the archipelagos and on bird wetlands. An alien species may also share an ecological niche with an indigenous species, constricting the habitat of the latter or supplanting it altogether. This may have already happened in Finland in the case of the [American] mink vs. the European mink (*Mustela lutreola*). In many cases, alien species simply lack natural enemies that would limit the growth and spreading of their population.

According to a report on endangered species in Finland (2010), alien species have affected the endangered status of certain species in our country. An invasive alien species is mentioned as a threat

1. <http://www.europe-aliens.org/>

2. The natural environment produces important commodities such as food, water and wood for firewood and construction, while also ensuring the functioning of processes beneficial to humans, such as regulation of floods and diseases, pollination of crops and prevention of soil depletion. The natural environment is also important for tourism, recreation and mental wellbeing. All of the above are collectively known as ecosystem services. The Economics of Ecosystems and Biodiversity 2008–2010 (www.teebweb.org).

for a total of 26 endangered or near threatened species. For instance, roadside growths of the vulnerable bristly bellflower (*Campanula cervicaria*) are threatened by the robust proliferation of the large-leaved lupine (*Lupinus polyphyllus*). In the archipelago, the [American] mink and raccoon dog are threats particularly to the common eider (*Somateria mollissima*) and velvet scoter (*Melanitta fusca*). The future success of the endangered Scots elm (*Ulmus glabra*) and European white elm (*U. laevis*) is compromised by the spreading of the Dutch elm disease (*Phloestoma ulmi*) to Finland. The Japanese rose (*Rosa rugosa*) is by far the most significant threat to Finland's endangered species, being noted as a threat to nine butterfly species inhabiting coastal sands, four fly species, two agaric fungi species and six vascular plant species.

The impact of alien species was considered conservatively in the endangered species report and only mentioned in cases where the effect was clear. It is therefore probable that the true impact of alien species is greater than that.

There are also known cases where the structure and function of entire ecosystems, such as food chains, have changed substantially due to the arrival of an alien species. For instance, Canadian waterweed (*Elodea canadensis*) is rapidly spreading in Finnish waterways, causing ecological changes in freshwater ecosystems. The Japanese rose is taking over sandy beaches and islands, causing significant changes in the structure and species inventory of coastal ecosystems.

Biodiversity and ecosystem services are known to form the foundation of the wellbeing of society and to have substantial economic value. The harmful impact of invasive alien species on the natural environment, biodiversity and ecosystem services may thus have direct and indirect adverse effects on human wellbeing too.

Threats to actors in society and the economy

Invasive alien species cause harmful social effects and substantial financial losses to a variety of actors. Many invasive alien species are major pests in agriculture and forestry. Fishing and fish farming may also suffer from the spreading of invasive alien species; for instance, the collapse of the noble crayfish catch as a consequence of crayfish

plague has had a substantial economic impact in Finland.

Alien species may also pose a health hazard or function as disease carriers. For instance, the giant hogweed (*Heracleum mantegazzianum*), Persian hogweed (*H. persicum*) and Sosnowsky's hogweed (*H. sosnowskyi*) originating in south-eastern Asia may cause serious skin symptoms by contact. Another powerful allergenic plant is the common ragweed (*Ambrosia artemisiifolia*), which is already widespread in Europe and with global warming may come to thrive in Finland too. Disease-spreading alien species in Finland include the common rabbit (*Oryctolagus cuniculus*) (tularemia); the Canada goose (*Branta canadensis*) (influenza A); and the raccoon dog, [American] mink and domestic cat when feral (*Felis silvestris catus*) (rabies). Alien species cannot in and of themselves be considered a disease threat, but their indirect harmful impact should be anticipated. As a new animal species becomes settled and established, this may create a wholly new ecological niche for a pathogen which previously did not have a suitable indigenous host. Even then, a health risk to humans or animals will of course only be actualised if the pathogen also arrives in the country and finds a home in the established alien animal species. Alien species must be monitored, including the tracking of the size and range of established populations of alien species, and in the long term this will enable assessment of potential disease risks for both animal diseases and animal-borne diseases.

Invasive alien species also cause problems for recreational activities and tourism. The spreading of the Canadian waterweed and the Japanese rose not only causes environmental changes but also adversely affects the use of shores and inland waterways for recreation.

Invasive alien species may also damage infrastructure. For instance, the widespread brown rat (*Rattus norvegicus*) causes considerable damage worldwide by chewing through electrical, phone and data cables. The common rabbit tunnels under parks and roads, and the dark false mussel (*Mytilopsis leucophaeata*) clogs up water intake pipes for instance at power plants. The signal crayfish (*Pacifastacus leniusculus*), like many other crayfish, digs burrows to nest in, which may undermine riverbanks.

Economic impacts

Invasive alien species cause substantial economic damage worldwide. In 2001, it was estimated³ that the annual damage caused by invasive alien species worldwide exceed USD 1,400 billion (EUR 1,054 billion), equivalent today (2010) to about 2% to 3% of the combined GDP of the world. In the USA, the economic damage caused by invasive alien species is estimated at USD 128 billion (EUR 96.4 billion) per year.

Europe has traditionally been regarded as a region where both the number of alien species and the problems caused by them have been considerably lower than on other continents. In recent years, considerable contributions have been made to the knowledge on alien species in Europe, particularly through the research in two EU-funded projects, DAISIE and ALARM. At the same time, it has emerged that earlier estimates of the number of alien species in Europe were grossly inadequate and that the problems caused by invasive alien species are much more extensive and much more serious than previously thought.

Of the 11,000 or so alien species found in Europe, probably 10% to 15% cause some kind of harmful ecological or economical impacts. Even at a cautious estimate, the value of the damage caused by these invasive alien species by 2011 amounts to at least EUR 12.5 billion per year. This may be regarded as a minimum, as the true economical and ecological impacts of the majority of alien species found in Europe are not known. Also, in the absence of hard information estimates usually only cover a fraction of potential harmful impacts.

In the UK, for instance, invasive alien species cause damage at a rate of GBP 1.7 billion (EUR 2 billion) per year. In Sweden, it has been estimated that the harmful impacts of 13 invasive alien animal and plant species (including diseases)⁴ may be anything from EUR 181 million to EUR 568 million per year. Similar comprehensive estimates or estimates per actor or per species group have been produced in some other European countries concerning the damages caused by invasive alien

species. Because these reports differ in scope and in their evaluation methods, it is difficult to compare the data from different countries.

Economic damage and prevention costs in Finland

One of the most significant harmful impacts caused by an invasive alien species in Finland is the collapse of the catch of noble crayfish because of crayfish plague, a disease of American origin. The losses caused by this were on the order of EUR 10 million per year throughout the 20th century, calculated at present producer prices. A similar situation causing devastating economic losses would emerge if one particular invasive alien species disastrous for the forest industry – the pine wood nematode (*Bursaphelenchus xylophilus*) – were to spread rapidly in Finland's forests. The costs of preventing pine wood nematode are presented in the national contingency plan (2011). The estimated costs arising from a single finding of pine wood nematode are 11–26 million euros.

No comprehensive estimate of the costs of damage caused by invasive alien species has been made in Finland. Regular costs are being incurred in Finland for instance through plant and animal inspections related to alien species, prevention measures against invasive alien species such as hogweeds, the Himalayan balsam and the Japanese rose, and hunting and trapping of small predators spreading to Finland. Costs are also incurred through working hours in administration and various official and unofficial bodies, through research and monitoring, through qualitative and quantitative production losses (crops and catches), and damages and their correction. Even the costs of disease and pest control, prevention and monitoring amount to several million euros per year in Finland. In 2010, the City of Helsinki spent about EUR 0.5 million on limiting the population of wild rabbits in the city and on damage prevention. Based on the situation in Europe and in Sweden in particular it has been estimated that the overall economic losses caused by invasive alien species in Finland are very probably on the order of tens if not hundreds of millions of euros per year. Taking geographical differences between Finland and Sweden into account, it has been estimated that Finland spends at least tens of millions of euros per year on alien species control measures alone, since many of the invasive alien species that have spread to Finland cause widespread economic impacts.

3. Pimentel et al. 2001: Economic and environmental threats of alien plant, animal, and microbe invasions.

4. The bay barnacle, furunculosis (a fish disease), fringed water-lily or yellow floating heart (an aquarium plant, *Nymphaoides peltata*), signal crayfish and crayfish plague, Spanish slug, Japanese rose, [American] mink, hogweeds, mugwort and ragweeds, HIV and AIDS, Dutch elm disease, and rats and mice.

Future threat: accelerated spreading of alien species and increasing risks

Alien species have highly diverse ecological characteristics and means and routes of spreading, and therefore preventing them from spreading calls for a wide range of measures. Although the threats of invasive alien species have been identified, it is a considerable challenge to prevent their proliferation.

New findings of alien species are made with increasing frequency, and the number of established alien species is growing. The deregulation of world trade, increased travel and private imports of plants and animals compound the risk of introducing alien species to increasingly wider environments. At the EU level, as in Finland, the challenge of preventing the spreading of invasive alien species is further complicated by the free movement of goods within the EU and internal market legislation. The growth of the pet trade and seed trade on the internet provides further opportunities for alien species migration and makes it more difficult to monitor and control them. The shortage or lack of monitoring and regulations in internet trade, for instance, makes it easy for alien species to spread to new environments.

Also, climate change and other man-made environmental changes or habitats increase the potential for alien species to spread northward and thus extend their range. Supporting the use of biofuels to help curb climate change may in fact also contribute to the spreading of alien species, as many of the crops used for producing biofuels in Europe and elsewhere in the world are alien to Finland's natural environment and may cause problems if imported.

The impacts of invasive alien species may be detected in several different areas of society at once. It is therefore necessary for administrative sectors and other actors to work together to evaluate, monitor, prevent and combat invasive alien species and their impacts. By extension, there is a need for a uniform set of guidelines regarding invasive alien species, Finland's National Strategy on Invasive Alien Species. Actions to combat the threats and harmful impacts of invasive alien species need to be planned and implemented.

FACTORS CONDUCIVE TO THE SPREADING AND ESTABLISHMENT OF ALIEN SPECIES

The spreading of alien species depends among other things on the characteristics of the species, the pathways and the circumstances in the destination area. It is difficult to predict accurately how well a species will survive in a new environment. Similarity of climate between the original range and the new distribution range is just about the only feature that commonly explains why alien species thrive in new areas.

However, there are certain properties that several successful alien species have been found to share. Most alien species are more competitive than the indigenous species in terms of propagation, for instance. Genetic diversity may contribute to the rate at which an alien species spreads and to the probability of established populations forming. A competitive advantage may be heightened if the alien species has no competing species, pathogens or parasites in the new area. Indeed, the broader and more diverse the distribution of an alien species is in its natural distribution range, the more likely it is that it will become an invasive alien species.

Ecosystems shaped by humans, such as gardens and other green areas, are excellent places for the introduction and spreading of alien species. Human actions (fields, forestry, culling of natural predators) and environmental changes caused by humans (eutrophication, acidification) help some alien species to adapt to their new environment. Waterways may also make an area more vulnerable to alien species. Streams and river deltas, whose shores tend to be extensively shaped by human actions, are favourable habitats for alien species. Also, natural disruptions shape the waterfront, exposing competition-free growth locations. Low-nutrient soils, for instance in bogs, meadows and shrubberies, have a low incidence of alien species, indicating that it is more difficult for alien species to form an established population in such an environment. On the other hand, there are species that thrive in low-nutrient Finnish soil, for instance the large-leaved lupine in meadows.

For an alien species to have a chance of establishing a permanent population and proliferate, its origin and destination areas must be similar in terms of their circumstances; for species to move

successfully to the Baltic Sea, they must come from similar conditions with regard to temperature and salinity. Extreme weather, eutrophication or acidification may further disrupt local habitats and enhance the spreading of alien species. Spreading is also helped by free trade, trade and transport routes, and the role of agriculture, forestry and tourism in the local economy.

ARRIVAL AND PATHWAYS OF ALIEN SPECIES

The spreading of alien species to new geographical areas is intentionally or unintentionally facilitated by humans (cf. the definition of an alien species). Globalisation, rapidly increasing international trade and transport and particularly new transport connections on sea, on land and in the air have led to an increased spreading of alien species.

Intentional import and distribution

Alien species have been and continue to be imported for commercial purposes. These intentional imports involve crops for cultivation and ornamentation, fish for aquaculture, and game for hunting and farming. Fish, reptiles, birds, mammals and invertebrates are imported as pets. Imports make it possible for alien species to spread further; an alien species may be intentionally or unintentionally released into the wild or, in the case of an animal, one may escape.

The trade in animals and garden plants is considered the most important individual factor in both intentional (about 70%) and unintentional (about 30%) introductions of alien species. Also, internet trade has made it easy to order products such as plant seeds or live food for aquarium fish from anywhere in the world. This too is conducive to the uncontrolled spreading of alien species.

Unintentional transportation of alien species caused by humans

The transportation of alien species from one area to another on means of transport, with raw materials and with equipment has become more common in the past decades. Alien species may migrate for instance with untreated timber or

wood packages. Alien species may also migrate on means of transport, for instance in the ballast water of ships or attached to their hulls. Unintentional imports mostly involve seeds, eggs (of invertebrates), diseases, parasites or species migrating with other species (epibionts). In recent years, the level of unintentional imports of alien species has risen compared with intentional releasing into the natural environment.

Canals, tunnels and other built routes as pathways

Species may also migrate through pathways built by humans: roads, railways, canals, bridges, tunnels or fish passes. Rapid and easy transport between and within continents also contributes to the spreading of alien species.

Example: Canals

Several alien species have migrated from the Black Sea and Caspian Sea through rivers and canals to Finland's coastal waters and to the almost-freshwater eastern end of the Gulf of Finland, including the mouth of the Neva River. The zebra mussel (*Dreissena polymorpha*) is both the best-known and the most harmful of the invasive alien species to have entered Europe via canals. It is estimated to have entered Finland's waters attached to floated logs. The significant growth of shipping on Russia's inland waterways will probably contribute to the spreading of alien species in a major way. Climate change is estimated to increase the spreading of animal species from the south towards the north through rivers and canals.

27

Current procedures regarding alien organisms at Finland's borders

Commercial goods transport and its regulation

In Finland, it is the responsibility of Customs to direct shipments of plants, plant products or timber arriving at the national border to the authority responsible for inspections, the Finnish Food Safety Authority Evira. On the basis of the inspection, Evira may either accept or reject the import and issue an order about what to do with a rejected shipment (destroy it or return it to the country of origin).

There are detailed provisions and regulations regarding the marketing and import of plants, plant

products, timber, animals and animal gametes.⁵ ‘Marketing’ refers here to trade on the EU internal market, and ‘import’ refers to importing from outside the EU.

Apart from restrictions concerning protected zones⁶, the marketing of plants that meet legal requirements as regards plant health, quality and labels, is free within the EU area.

Import requirements and restrictions apply to the import of plants from non-EU countries, in order to prevent plant diseases and pests from spreading alongside imported shipments. These requirements vary depending on the plant species, product and country of origin. The import of certain plant species from non-EU countries is prohibited.

When marketing planting seeds from EU Member States to Finland, the material must be certified and must not contain wild oats. When importing planting seeds from or exporting it to non-EU countries, the provisions of the Seed Trade Act and the Act on Protecting Plant Health must be complied with. Seeds other than planting seeds must also not contain wild oats.

The marketing or import to Finland of plants is, at the moment, not restricted on the basis that the plant species itself might be an invasive alien species; regulation is concerned with preventing species from entering the country with plant imports.

In the case of animal imports, all animals imported for commercial purposes are referred to a veterinary border inspection by the Finnish Food Safety Authority Evira.

Passenger traffic

According to plant health legislation⁷, passengers entering Finland from European non-EU countries may import for their private use, without a phytosanitary certificate, separately specified quantities of garden plants (trees, shrubs and perennials); potted plants and house plants; flower bulbs, tubers and roots; and fresh citrus fruit. A special import prohibition is in place on seed potatoes and eating potatoes; fire blight host plants; soil (field soil); compost; and manure.

Passengers entering Finland from outside Europe may import for their private use cut flowers (max 20) and any seeds and other plant products that do not require a phytosanitary certificate. Importing potted plants and garden plants without a phytosanitary certificate is prohibited. Such a certificate is also required for organic soil material imported with plants from most countries.

In the case of a passenger importing a maximum of five pets for which a veterinary border inspection is not required, compliance with import regulations is verified at a Customs office as per the relevant Decree of the Ministry of Agriculture and Forestry.⁸ This inspection is carried out by the Customs authorities as part of their control duties. Pets subject to this procedure are defined in the relevant Regulation of the European Parliament and of the Council.⁹ The requirements for animal health that pets must satisfy in the import inspection are specified in the relevant Decree of the Ministry of Agriculture and Forestry.¹⁰

The aforementioned inspection is carried out by the Customs authorities for passengers importing a maximum of five pets. If a passenger is importing more than five pets, the import is considered to be for commercial purposes, and the animals must comply with the requirements for animal health pertaining to commercial imports. Also, these animals must be subjected to a veterinary border inspection performed by Evira.

5. See e.g. the website of the Finnish Food Safety Authority Evira (www.evira.fi).

6. It is possible to restrict internal market trading in the EU by applying for protected zone status with regard to a species of plant pest that occurs in several EU Member States but not in the Member State applying for a protected zone. Host plants of the plant pest species in question may only be imported into a protected zone from another protected zone, or subject to more stringent import requirements than usual. Finland has been granted protected zone status with regard to six plant pest species.

7. Decree of the Ministry of Agriculture and Forestry 296/2006.

8. Appendix I to Decree 402/2011.

9. Regulation of the European Parliament and of the Council (EC) N:o 998/2003, Article 3 paragraph a: dogs, cats, ferrets, invertebrates (except bees and crustaceans), ornamental tropical fish, amphibia, reptiles, birds (except poultry covered in Directives 90/539/EEC and 92/65/EEC), rodents and domestic rabbits.

10. Decree of the Ministry of Agriculture and Forestry 866/2008.

INTERNATIONAL CONVENTIONS AND COMMITMENTS

International and other worldwide commitments

The *Convention on Biological Diversity* (CBD) is the most extensive convention outlining key international biodiversity goals. The Convention entered into force in December 1993, and by 2010 it had been ratified by 193 countries. With regard to alien species, Article 8(h) of the Convention states that each Contracting Party shall “prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species”. The Convention also requires the Contracting Parties to draw up national alien species strategies.

The fourth Conference of Parties of the CBD (1998) decided in its Decision IV/1 to respond to the threat of invasive alien species and noted that national complementary and reinforcing measures were required to combat invasive alien species. It was decided that alien species constitute a cross-cutting issue for implementation of many of the themes in the Convention, as invasive alien species affect all taxonomic groups and ecosystems. Alien species are named in several of the thematic working programmes of the CBD and are involved in several cross-cutting issues. The sixth Conference of Parties (2002) adopted a 15-point Guiding Principles document on invasive alien species. Subsequent decisions at Conferences of Parties have focused on identifying knowledge gaps regarding invasive alien species and the collecting of related information, such as information on the migration and spreading of invasive alien species.

An in-depth review of invasive alien species was conducted at the ninth Conference of Parties of the CBD (2008), and decisions taken at the tenth COP in Nagoya (2010) concerned the study of “invasive alien species introduced as pets, aquarium and terrarium species, and as live bait and live food”. The Nagoya COP also decided on a Strategic Plan whose target is that “by 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.” The principal pressures threatening biodiversity

are identified as changing habitats, invasive alien species, overuse of natural resources, climate change and pollution.

In 2004, the International Maritime Organisation (IMO) adopted the *International Convention for the Control and Management of Ships' Ballast Water and Sediments*, in which great expectations were vested.¹¹ This Convention sets global requirements for the handling of ballast water. According to the Convention, vessels must between 2010 and 2016 (in stages, depending on their ballast capacity and year built) be equipped with a ballast water treatment system to prevent the spreading of alien species. These requirements will be applied stagewise to vessels built before 2009 too, so that after 2016 all vessels will be equipped with such a system. The Convention will enter into force after 30 countries representing a minimum of 35% of the world's combined commercial vessel tonnage have ratified it. By spring 2011, 27 countries representing 25% of said tonnage had ratified the Convention.

The *Global Strategy for Plant Conservation* was drawn up by the CBD secretariat together with the Botanic Gardens Conservation International NGO. Its goals include preparing prevention programmes for at least the top 100 invasive alien species threatening plant species, plant communities, habitats and ecosystems.

The World Trade Organisation (WTO) has introduced the *Agreement on the Application of Sanitary and Phytosanitary Measures*, also known as the *SPS Agreement*, to specify measures employed to protect human, animal or plant life or health or to prevent damage from risks caused by the entry, establishment or spread of alien animals, plants, pests, diseases or pathogens. The basic idea of the SPS Agreement is that such measures may be allowed to restrict free trade, provided that 1) they are only employed insofar as they are necessary to protect human, animal or plant health; 2) they are scientifically justified; 3) they do not place otherwise similar countries in an unequal position; 4) they do not restrict trade any more than is necessary; 5) imported products are not subject to tighter restrictions than domestic products; and 6) the risk requirements on imported products are consistent.

Scientific evidence is one of the basic tenets of the SPS Agreement. Risk assessment must be based on scientific evidence, and the cost-effectiveness of risk limitation measures must be taken into

11. www.imo.org/

account. Essentially, applying the precautionary principle is not allowed under the SPS Agreement, unless scientific research into the matter is launched at the same time. According to a decision taken in 1998, the texts of the Codex Alimentarius (food safety), the World Organisation for Animal Health OIE (animal diseases and zoonoses) and the International Plant Protection Convention (IPPC) are binding international standards under the SPS Agreement. The WTO, which was founded in 1995, has 153 Member States, including nearly all of the major trade nations in the world.

The *Convention on the Conservation of Migratory Species of Wild Animals* (also known as the Bonn Convention) was adopted in 1979. According to the Convention, the Contracting Parties will aim “to prevent, reduce or control factors that are endangering or are likely to further endanger [...] species”. The means to be employed include strict control of the translocation of alien species and strict control or eradication of an already established alien species.

The purpose of the *International Plant Protection Convention* (IPPC) adopted by the United Nations Food and Agricultural Organisation (FAO) in 1951 is to ensure global and effective action to prevent the migration and spread of plant pests and to promote measures to combat them. The definition of plant pests under the IPPC includes not only pathogenic agents and harmful animals but also harmful alien plant species. This Convention plays an important role in international trade, as the WTO SPS Agreement acknowledges the IPPC and the International Standards for Phytosanitary Measures (ISPM) based thereon.

The IPPC organisation has included the protection of the natural environment and biodiversity as related to the spread of invasive alien species in its remit. In this, it collaborates with the CBD organisation, as formalised in a Memorandum and Joint Work Programme. The IPPC organisation has amended the ISPM11 standard (Pest risk analysis for quarantine pests) to include plant pests (particularly harmful plant species) with a primary impact on the environment and biodiversity. In the Decision concerning invasive alien species adopted at the ninth Conference of Parties of the CBD, the Contracting Parties are encouraged to make use of the risk assessment and other procedures and standards developed under the IPPC especially with regard to alien species with harmful impacts on plant biodiversity.

The *Convention on Wetlands of International Importance, or the Ramsar Convention*, concerns areas of importance as waterfowl habitats. The Strategic Plan for 2009–2015 of the Ramsar Convention includes goals concerning invasive alien species. By 2015, “all Parties [must] have a national inventory of invasive alien species that currently or potentially impact the ecological characters of wetlands, especially Ramsar sites.” The Parties are required to “develop guidance and promote procedures and actions to prevent, control or eradicate [alien] species in wetland systems”. Parties must also “[identify] more comprehensively the problems posed by invasive species in wetland ecosystems within their territories”. By 2015, “national invasive species control and management policies or guidelines [must be] in place for wetlands”.

European regional strategies, conventions and cooperation

The *European Strategy on Invasive Alien Species* (2003) is a pioneering step towards a European framework on invasive alien species; this pan-European strategy was adopted under the Bern Convention (1979). The Convention sets the goal of every country drafting its own national invasive alien species strategies and action plans.

The *Council of Europe European Strategy for Plant Conservation 2008–2014* was drawn up by the Council of Europe together with the Planta Europa network. It contains several goals regarding invasive alien species, including: the creation of a framework for the combating and monitoring of the 15 most harmful invasive alien species in various regions of Europe; the improvement of the DAISIE database to cover 80% of European countries; and the promoting of the introduction of the voluntary Code of Conduct on Horticulture and Invasive Alien Plants in European countries.

The *Baltic Marine Environment Protection Commission*, usually known as the *Helsinki Commission* (HELCOM), was founded in 1974. The Convention on the Protection of the Marine Environment of the Baltic Sea Area, or the Helsinki Convention, entered into force in 1980. The members of HELCOM are the European Union and all countries bordering the Baltic Sea. The purpose of the Baltic Sea Action Plan drawn up by HELCOM is to “restore the good ecological status of the Baltic marine environment by 2021”. The Action Plan covers the most crucial issues in the

Baltic Sea, including marine biodiversity and preserving the natural environment. Pursuant to this, HELCOM has agreed on various measures to be undertaken in the Baltic Sea area to prevent to migration of alien species to the Baltic Sea particularly with ballast water and sediments. HELCOM has also taken steps to prepare its members to ratify the IMO Ballast Water Convention as soon as possible so that it can be applied in the Baltic Sea area.

The *European and Mediterranean Plant Protection Organisation* (EPPO) is a regional plant protection organisation subordinate to the IPPC, responsible for international plant protection co-operation in Europe and around the Mediterranean. The EPPO prepares risk analyses on new plant pests in Europe, develops international strategies for the prevention of the migration and spread of plant pests that damage crops and forests, contributes to the harmonisation of plant protection legislation and other official plant protection measures, and promotes the use of new, safe and effective plant pest monitoring methods. Invasive alien species matters are discussed by the EPPO's Panel on Invasive Species, which lists plant species that risk assessment has shown to be harmful within the EPPO's domain, warns member states of them and drafts control procedures for them.

The *European Network on Invasive Alien Species* (NOBANIS) is a regional information channel for invasive alien species originally set up at the initiative of the Nordic Council of Ministers. The communication network currently consists of the Nordic and Baltic countries, Germany, Poland, Russia, the Netherlands, Slovakia, Ireland and Austria, and other EU Member States are joining. The principal purpose of this network is to convey information, to co-ordinate action against invasive alien species, to highlight problems caused by them and to find ways of solving those problems. The national liaison officers in the NOBANIS project have participated in research projects such as the EU DAISIE project, and NOBANIS is currently participating in the preparation of the EU risk assessment and early warning system. The NOBANIS alien species website collects and updates information from member states and provides background information on alien species. The website includes an alien species database where member states have contributed in-

formation on their alien species, and a pilot alien species alert system notifying users of invasive alien species observed in the region on which information is being provided or requested. Setting up and maintaining the network has been dependent on funding from the Nordic Council of Ministers. The contribution of the liaison officers from the participating countries is vital for the continued functioning of the network.

Voluntary co-operation

The Code of Conduct on Horticulture and Invasive Alien Plants (2008) is a *voluntary code of conduct* for governments and the horticulture industry and trade, prepared by the Council of Europe and the EPPO. Its purpose is to encourage horticulture professionals to work together to disseminate best practices in order to increase awareness of the invasive alien species problem, to curb the spread of invasive alien plants already in Europe and to prevent the invasion of new ones.

Voluntary guidelines for ships to exchange their ballast water to prevent the spread of alien species to the Baltic Sea with ballast water were adopted under the OSPAR Convention protecting the marine environment of the north-eastern Atlantic and HELCOM in 2008. These guidelines apply to traffic between the Baltic Sea and the North Sea, but a decision has been made to extend them to traffic in the Mediterranean Sea too.

EU actions to combat invasive alien species

At the European Council in Gothenburg in 2001, the EU decided to halt the loss of biodiversity by 2010.¹² Measures aimed at invasive alien species were considered of primary importance at the EU level, because the harmful impacts of invasive alien species are heightened as biodiversity is lost.

In March 2010, the EU adopted its most recent biodiversity target: *Halt the loss of biodiversity and ecosystem services in the EU by 2020 and restore them insofar as possible, and step up the EU's contribution to averting global biodiversity loss.*¹³ Invasive alien species were listed as one of the most important threats to biodiversity.

In May 2011, the European Commission issued a Communication entitled *Our life insurance, our natural capital: an EU biodiversity strategy to*

12. COM (2001) 264

13. COM (2010) 4

2020.¹⁴ Target 5 in this strategy is: “By 2020, Invasive Alien Species and their pathways are identified and prioritised, priority species are controlled or eradicated, and pathways are managed to prevent the introduction and establishment of new invasive alien species.”

Under Article 6 of the *Sixth Environment Action Programme of the European Community* (2002–2012), objectives and priority areas for action on nature and biodiversity include “halting biodiversity decline with the aim to reach this objective by 2010, including prevention and mitigation of impacts of invasive alien species and genotypes”. The Action Programme also seeks to develop measures for preventing and monitoring the spread of alien species, including alien genotypes.

In the Annex to the European Commission’s Communication on biodiversity policy (2006), Member States are encouraged to prepare their national invasive alien species strategies by 2007 and to implement them by 2010.

The European Commission is currently preparing a new *Plant Health Strategy*, which will be completed in 2012. For this purpose, the functioning of the EU’s current phytosanitary legislation was assessed in 2009 and 2010. One of the points assessed was the incorporation of invasive alien species in EU phytosanitary legislation. The assessment group recommended in its report that invasive alien species should be incorporated in EU phytosanitary legislation because it would be practical and effective. There are resources and tools in place in the plant health sector, and the relevant legislation is completely harmonised at the EU level. This would also mean that EU plant health legislation would be better in tune with IPPC recommendations.

Current EU legislation on alien species

EU provisions directly addressing invasive alien species are divided among several pieces of legislation. One of these is the *Plant Health Directive* (Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community). EU legislation on animal dis-

eases may be applied to invasive alien animals carrying pathogens. *Council Regulation* (EC) No. 338/97 on the protection of species of wild fauna and flora by regulating trade therein authorises the Commission to enact Regulations (most recently Commission Regulation (EU) 997/2010) restricting for instance the introduction to the EU “of live specimens of species for which it has been established that their introduction into the natural environment of the Community presents an ecological threat to wild species of fauna and flora indigenous to the Community”. There are four such species at this time: the ruddy duck (*Oxyura jamaicensis*), painted turtle (*Chrysemus picta*), red-eared slider (*Trachemys scripta elegans*) and American bullfrog (*Rana catesbeiana*).

Council Regulation (EC) 708/2007 concerning use of alien¹⁵ and locally absent species in aquaculture specifies that a risk assessment must be performed in connection with the introduction or translocation of aquatic organisms and non-target species in aquaculture. The *Birds Directive* (EEC) 409/79 and the *Habitats Directive* (EEC) 43/92, known collectively as the *Nature Directives* (EEC) 409/79 and 43/92, forbid the release into the wild of species that may threaten indigenous species.

There are also other provisions addressing invasive alien species. The *Birds Directive* (EEC) 147/2009 and the *Habitats Directive* (EEC) 43/92 constitute the principal nature conservation legislation of the EU. The *Birds Directive* applies to European wild birds, while the *Habitats Directive* applies to wild animals, plants and habitats. The general purpose of the *Birds Directive* is to maintain all of Europe’s wild bird populations at a level consistent with ecological, scientific and cultural requirements. The purpose of the *Habitats Directive* is to achieve and maintain a favourable level of protection for certain species and certain habitats. A species must enjoy long-term survival in its natural environment, and its natural distribution must not shrink. Also, there must be enough natural habitats for the species to ensure the long-term survival of the population. Today, birds too are in practice covered by the ‘favourable conservation’ target in the *Habitats Directive* adopted later than the *Birds Directive*; this principle is incorporated into Finland’s *Nature Conservation Act*.

The *Water Framework Directive* (EC) 60/2000 requires Member States to achieve good ecological potential in their bodies of water and harmonises water protection measures in the EU. The pur-

14. COM (2011) 244

15. The Finnish translation of this Regulation erroneously refers to ‘non-native species’ rather than ‘alien species’.

pose of the Water Framework Directive is that it “prevents further deterioration and protects and enhances the status of aquatic ecosystems [...]; promotes sustainable water use based on a long-term protection of available water resources; aims at enhanced protection and improvement of the aquatic environment [...] through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and [...] priority hazardous substances; ensures the progressive reduction of pollution of groundwater and prevents its further pollution; and contributes to mitigating the effects of floods and droughts”. It is one of the requirements for good ecological status that no alien species introduced to a waterway may cause (more than negligible) harm to indigenous species or the structure or functioning of the local ecosystem.

The Directive of the European Parliament and of the Council establishing a framework for community action in the field of marine environmental policy (EC) 56/2008, also known as the *Marine Strategy Framework Directive*, aims to promote sustainable use of the seas and conserving marine ecosystems. The Marine Strategy Framework Directive acknowledges that non-indigenous species are a major threat to European biodiversity and requires Member States to take these into account when defining what the ‘good status’ of the environment means. Annex I of the Directive specifies that in determining good environmental status “non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems”. Annex III of the Directive notes that implementation of the Directive will require “an inventory of the temporal occurrence, abundance and spatial distribution of non-indigenous, exotic species or, where relevant, genetically distinct forms of native species, which are present in the marine region or subregion”. Member States are required to develop a marine strategy for their marine waters; in Finland, this is known as a national marine resources management plan. The national marine resources management plan includes an evaluation of the state of the marine environment, targets for it, indicators describing it and how it is monitored. An action plan for improving the marine environment will be drawn up to support the national marine resources management plan by 2016.

Research into alien species in the EU

The EU is funding research and development projects focusing on alien species. For instance, funding for two invasive alien species projects – ALARM and DAISIE – has been granted out of the Sixth Framework Programme for Research and Technological Development. Projects concerning invasive alien species have also been funded out of the 7th such Programme, including the joint Baltic Sea research and development programme (BONUS), where invasive alien species form one of the key research themes. The LIFE Programme is also funding projects aimed at combating and eradicating invasive alien species. The EU regional development funds (ERDF and ESF) and the European Agricultural Fund for Rural Development (EAFRD) may also support projects for combating invasive alien species, and funding for similar purposes may also be available from the European Fisheries Fund.

Elements of EU legislation concerning invasive alien species

Current EU legislation and policy provide a solution to part of the problem with invasive alien species. However, so far there has been no mechanism at the EU level for aligning or harmonising measures undertaken by neighbouring countries or countries in the same region with regard to invasive alien species. The disparate means and measures hitherto employed have not been very effective at reducing the threats and risks caused by invasive alien species in Europe. Accordingly, the European Commission has investigated knowledge gaps concerning invasive alien species and particularly the existing relevant legislation, research programmes, action plans and other initiatives to find out what is already being regulated and where there is still scope for improvement. A large such gap in measures and legislation was found in the area of online commerce.

In December 2008, the European Commission adopted the Communication “*Towards an EU Strategy on Invasive Species*”. This was the first step on the path to an EU strategy for addressing the problems caused by invasive alien species. The Commission is preparing a proposal for elements in EU legislation that would significantly reduce the harmful impacts of invasive alien species on European biodiversity. The Commission is also setting up an early warning and alert system related to invasive alien species, based on regular-

ly updated mapping and effective counter-measures. The aim is that by the end of 2012 the Commission will adopt a proposal for the legislative elements required for the combating of invasive alien species, most probably a directive.

FINNISH LEGISLATION AND ACTIONS

Current legislation on alien species

Legislation concerning invasive alien species has been enacted and enforced in certain sectors in Finland. The *Nature Conservation Act* (1096/1996) states that non-indigenous species are not to be released into the wild if there is cause to suspect that the species may become established permanently. Alien species are also referred to in the *Hunting Act* (615/1993, 915/2011), the *Fishing Act* (286/1982, 252/1998), the *Animal Disease Act* (55/1980) and, with regard to plant pest eradication, in the *Act on Protecting Plant Health* (702/2003), the *Plant Propagation Material Act* (also known as the *Seedlings Act*, 1205/1994) and the *Seed Trade Act* (728/2000). The provisions of the *Forest Act* (1093/1996), the *Forest Insect and Fungi Damage Prevention Act* (263/1991) and the *Act on Trade in Forest Reproductive Material* (241/2002) may also be applied to alien species. In addition to the above, the following may be considered indirectly to address alien species: the *Act on Preventing Wild Oat* (185/2002), the *Animal Welfare Act* (247/1996), the *Decree of the Ministry of Agriculture and Forestry on the animal disease requirements relating to imports from countries outside the European Community of certain live animals and their embryos and gametes* (866/2008), the *Water Act* (264/1961), the *Environmental Protection Act* (86/2000), the *Act on Water Resources Management* (1299/2004) and the *Public Order Act* (612/2003).

The provisions concerning alien species referred to above are given in detail in **Appendix I** to this strategy.

International co-operation and national strategies and programmes

Finland is a member in the Nordic Baltic Network on Invasive Species (NOBANIS), where the status of invasive alien species in various countries has been charted and online material concerning

combating them has been published, among other things. Finland is also involved in international co-operation in the area of invasive alien species through the International Plant Protection Convention (IPPC), the Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM) and the International Council for the Exploration of the Sea (ICES). As a member state of the European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC) under the FAO, Finland has on several occasions reported on and drawn attention to alien fish and crayfish species, both in the wild and in fish farming.

The *National Strategy and Action Plan for Conservation and Sustainable Use of Biodiversity in Finland 2006–2016* includes a goal for drawing up a National Strategy on Invasive Alien Species. According to that strategy, co-operation between authorities must be improved so as to leverage comprehensively the expertise in invasive alien species management that exists in various sectors. The Action Plan of that strategy proposes the following measures: “1) Finland will participate actively in international co-operation to combat the spread of alien species through international trade; 2) The national strategy and action plan for alien species required under the CBD will be prepared; 3) Studies and monitoring of alien species will be continued in order to facilitate the recognition of their significance and the planning of the necessary countermeasures; 4) Publicity materials will be published, for example on well-known alien species known to be harmful, and means to combat their spread; 5) Research and development work on methods of combating alien species that spread via the ballast water of ships will continue, with regard to the IMO International Convention for the Control and Management of Ships’ Ballast Water and Sediments. Finland will also ratify this Convention.”

Finland has also enacted certain other restrictions governing national strategies and regional efforts, preventing the spread and use of alien species within the country. These include the fisheries administration crayfish strategy and the ‘High Grade Area’ in Northern Ostrobothnia established to protect seed potato production.

Observing the precautionary principle

The precautionary principle is one of the fundamental tenets of international environmental law. Essentially, it says that an absence of complete sci-

entific certainty must not be used as an excuse not to undertake certain environmental protection measures.

The Convention on Biological Diversity (1992) formulates it thus: “The precautionary principle states that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat.”

The precautionary principle is an important factor in alien species management and in the prevention of damage by invasive alien species. According to the Guiding Principles concerning invasive alien species under the CBD, the precautionary principle must be observed in all decisions concerning invasive alien species, particularly those concerning introduction or translocation. The precautionary principle must also be observed in planning alien species management. Lack of scientific evidence must not be used as a reason for postponing or neglecting any prevention or eradication measures. Under the SPS Agreement, application of the precautionary principle is possible if at the same time research is undertaken to find scientific evidence for the necessity to restrict trade.

The precautionary principle underlies the determination of actual and potential damage caused by invasive alien species as per the National Strategy on Invasive Alien Species. The precautionary principle is thus one of the cornerstones of the National Strategy on Invasive Alien Species; applying it is much more cost-effective than correcting damage caused by invasive alien species after the fact. In fact, minimising adverse impacts may be construed as tantamount to applying the precautionary principle in practice.

DEFINITIONS AND CONCEPTS

Finland's National definitions and concepts were drawn up for this strategy by a group of experts. The aim was to make these definitions and concepts internationally compatible and consistent.

Alien species

An alien species is a species spread into the wild which was not an indigenous species in that eco-

system and could not have spread there on its own accord. In other words, an alien species has migrated over natural barriers to migration (such as a continent, a sea or a mountain range) with intentional or unintentional human assistance.

Invasive alien species

For the purposes of this Strategy, an invasive alien species is an alien species which is already established in Finland and which in a certain area, in a certain place and at a certain time causes direct or indirect ecological, economic, health-related or social adverse impacts, i.e. harm, necessitating specific measures to combat same. Such measures may include the prevention and combating, early detection and eradication of such impacts, prevention of spread and limitation of continuous long-term impacts, or adaptation to the harm caused by invasive alien species. (For further definitions of concepts related to the impacts and combating of invasive alien species, see Table 3.)



Invasive alien species Himalayan balsam
(*Impatiens glandulifera*) PHOTO: TERHI RYTTÄRI



Invasive alien species Japanese rose
(*Rosa rugosa*) PHOTO: TERHI RYTTÄRI

Table 2. The terms ‘alien species’ and ‘invasive alien species’ as defined in the Convention on Biological Diversity (CBD), in the EU (European Commission Communication “Towards an EU Strategy on Invasive Species”, 2008), in the International Plant Protection Convention (IPPC) and in the Global Invasive Species Programme (GISP).

	Finnish term	Convention on Biological Diversity (CBD)	EU	International Plant Protection Convention (IPPC)	Global Invasive Species Programme (GISP)
Alien species	Vieraslaji	Species, subspecies or lower taxon, introduced outside its natural past or present distribution. Includes any part, gametes, eggs, or propagules of such species that might survive and subsequently reproduce.	An alien species is a species that is deliberately or unintentionally introduced outside their natural habitats where they establish, proliferate and spread.	An alien species is an individual or population, at any life stage, or a viable part of an organism that is non-indigenous to an area and that has entered by human agency into the area.	
Invasive Alien Species	Haitallinen vieraslaji	An alien species whose introduction and/or spread outside its natural past or present distribution threaten biological diversity.	An invasive alien species is a species whose introduction and/or spread threaten biological diversity.	An invasive alien species is an alien species that by its establishment or spread has become injurious to plants, or that by risk analysis is shown to be potentially injurious to plants.	An alien species whose appearance and spread threaten ecosystems, habitats or species by causing economic or environmental harm.

Invasive alien plant species with health implications:

Hogweeds

Hogweeds are a group of plants originating in Asia; species found in Finland to date are the giant hogweed (*Heracleum mantegazzium*) and the Persian hogweed (*H. persicum*). A third, Sosnowsky's hogweed (*H. sosnowskyi*), is spreading across the eastern border and has already been observed in North Karelia.

Hogweeds are a textbook case of all the problems that invasive alien species can cause. Originally cultivated as impressive ornamental plants, hogweeds gradually escaped control, and today it is estimated that there are thousands of hogweed stands in Finland. The sap of hogweeds is phototoxic, meaning that it reacts with sunlight; on human skin, it can cause serious injuries similar to burns which are slow to heal or in some cases permanent. No other plants can grow in dense hogweed stands. A plot taken over by hogweeds declines in value, and in heritage landscapes the plant can be considered harmful to the landscape. Hogweeds can also obstruct recreational use, such as recreational fishing, due to their tendency to populate riverbanks.



PHOTO: TERHI RYTTÄRI

Invasive alien greenhouse pest:

***Nesidiocoris tenuis* plant bug**

In autumn 2008, the alien tropical plant bug species *Nesidiocoris tenuis* managed to penetrate two greenhouse facilities in Ostrobothnia; damage caused by it began to show in tomatoes in early 2009. This plant bug closely resembles the *Macrolophus* bugs used for pest control. *N. tenuis* bugs are bred commercially for pest control of whiteflies (*Aleyrodoidea*) in the Mediterranean countries. Indeed, in moderate quantities this species is very effective in destroying whiteflies; but if there are too many *N. tenuis* bugs compared to the number of whiteflies, they will begin to feed on the plants in absence of other food.

Despite concerted efforts, it has proved impossible to completely eradicate the *N. tenuis* plant bug. It is a considerable nuisance in Finland, as it damages tomato plants and breeds efficiently especially in conditions with artificial lighting. It also displaces *Macrolophus* bugs and thus undermines their efficacy in biological pest control. Replacing *Macrolophus* with *N. tenuis* would require the occasional use of chemicals in tomato cultivation to keep the number of bugs under control.



PHOTO: VEIKKO RINNE

Potentially or locally harmful alien species

For the purposes of this strategy, 'potentially or locally harmful alien species' are 1) alien species not yet established within Finland's national borders but considered harmful at the European or global level, with a high probability to arrive in

Finland, or 2) (locally) established alien species that may become harmful through a particular change in circumstances.

In keeping with the precautionary principle, this strategy lists some species as potentially or locally harmful that may later prove to be negligibly or not at all harmful.

Potentially harmful alien plant species with health implications:

Common ragweed

The common ragweed (*Ambrosia artemisiifolia*) belongs to the Aster family, like the mugwort. Both are allergenic plants that cause respiratory symptoms and asthma. The common ragweed is commonly found in Finland in harbours, on waste land and near bird feeding areas, as its seeds commonly occur in bird seed mixes.

The common ragweed blooms in late summer or late autumn, and in Finland its seeds generally do not have time to mature. In southern Europe, it is already one of the most harmful allergenic plants, and with climate change it is possible that it will proliferate here too. In the EU, the costs of combating this species have proved to be formidable.



PHOTO: TERHI RYTTÄRI

Particularly harmful alien animal species in the archipelago:

[American] mink

Finland's feral mink population originated with individual animals that escaped from fur farms in the 1930s. The population has probably been augmented from introduced populations in Russia. The [American] mink (*Mustela vison*) originated in North America.

The [American] mink is a particularly harmful alien species. It not only competes with the indigenous European mink, it is also a very effective predator of birds, among other things. The [American] mink prevents the restoration of the European mink in Finland and already threatens the existence of the latter species in Europe. The impact of the [American] mink is the greatest on birds nesting in the archipelago. It may also have a harmful impact for instance on frogs.

Effective eradication measures have been undertaken against the [American] mink in Saaristomeri National Park, using dogs and other means. Populations of many birds, such as the black guillemot and the tufted duck, have revived in the eradication area.



PHOTO: MINISTRY OF AGRICULTURE AND FORESTRY

Particularly harmful alien species

For the purposes of this strategy, 'particularly harmful alien species' requiring immediate action are established or potentially harmful alien species which 1) when found must immediately be eradicated employing existing measures specified in legislation, or 2) when found must immediately be addressed with especially effective measures to prevent its spread and to mitigate its harmful impacts. Particularly harmful alien species should principally be identified through risk assessment.

Potential alien species

A potential alien species is a species the entry of which into the country by direct or indirect human action is possible. Such an alien species may or may not be harmful.

Immigrant species

Non-native species are species that have spread to Finland of their own accord relatively recently (i.e. within the past 200 years or so). Some immigrant species have entered Finland because of the extension of their natural distribution range in neighbouring areas. This spread may be assisted by periods of warm weather and favourable winds. It is difficult to make a distinction between immigrant species and alien species particularly regarding plants, because the ranges of plant species have varied greatly with changes in the climate, and seeds may remain dormant but viable for anything up to several centuries. Examples of immigrant species include the common wild boar and the great cormorant; accordingly, these are not addressed in this strategy.

Immigrant species that entered Finland naturally:

Common wild boar

The first isolated observations of common wild boar (*Sus scrofa*) were made on the south coast of Finland in the 1950s. The species properly began to spread into Finland from the southeast in the 1970s. This was a natural process caused by growth and expansion of the wild boar population on the southern side of the Gulf of Finland, which in turn was caused by favourable conditions such as a warmer climate.

The common wild boar is not an alien species; it is a non-native species that has spread to Finland of its own accord, and **therefore it is excluded from this Finland's National Strategy on Invasive Alien Species.** The common wild boar is now a natural part of Finland's fauna, just like the European hare, which entered Finland similarly from the southeast some 50 years earlier.

Returning species:

Great cormorant

Archaeological bone findings date the history of the great cormorant (*Phalacrocorax carbo*) in what is now the Baltic Sea area to just after the Ice Age. By the beginning of the 20th century, however, the great cormorant had been completely eradicated from the Baltic Sea, and it took 50 years for the species to return to this part of its distribution range. The species began a rapid natural spread into the Baltic Sea from the North Sea coast in the early 1980s and re-entered Finland in 1996. Rapid population growth was enabled by an abundance of fish suitable for food, e.g. common roach proliferating due to eutrophication in the outer archipelago.

The great cormorant is not an alien species and is therefore excluded from this Finland's National Strategy on Invasive Alien Species.

Table 3. Further definitions of concepts related to the impacts and combating of invasive alien species based on the classification given in the Convention on Biological Diversity (CBD).

Ecological harm: Adverse impacts such as competition, predation, elimination (direct or indirect) by invasive alien species, changes to important or key habitats, cross-breeding, spread of diseases, or other impacts primarily concerning indigenous species or habitats.

Economic harm: Adverse impacts such as production losses (quantitative or qualitative), prevention costs or market impacts (changes in supply, demand or price) caused by invasive alien species. Also infrastructure impacts.

Health-related harm: Morbidity, mortality or pain caused by invasive alien species. Invasive alien species may also spread diseases.

Social harm: Adverse impacts caused by invasive alien species for instance on aesthetic values, recreational use, culture or employment or as conflict situations.

Prevention: Any measures designed to prevent the entry into the country of an alien species. Usually 'prevention' is used to refer to means such as legislation to prohibit importing, while 'combating' may be used to refer to concrete measures.

Early detection and [rapid] eradication: Any measures to find and eliminate as early as possible an alien species that has already entered the country.

Eradication: Any measures intended to completely remove a detected alien species (usually an invasive one) from a certain area or a certain location.

Containment: Any measures intended to limit the harm caused by an invasive alien species that has already entered the country, i.e. to stop the spread of an invasive alien species in a certain area or a certain location.

Control and long-term containment: Any measures aimed at an invasive alien species that has already entered the country and intended to prevent its harmful impacts from extending to a wider area or increasing in severity. Control measures may include the use of a pesticide, for instance.

Adaptation: Changing human behaviour so as to mitigate or remove the harm caused by the presence of an invasive alien species.

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Risk assessment

Risk assessment is a scientific process that consists of systematic identification of a hazard, a description of the hazard, an estimate of exposure to the hazard and a description of the risk involved. Risk assessment results are used as inputs in risk management and decision-making. Risk assessment is in close interaction with risk management. Risk analysis consists of forming a conception of the risk (risk assessment), publicising this conception (risk communications) and managing the risk (for instance through legislation, monitoring, voluntary action or licensing terms). Risk assessment may be quantitative or qualitative. The results of quantitative risk assessment are given as numeric values, while a qualitative risk assessment is essentially verbal, though it may include quantitative components (numerical values or mathematical methods).

For the purposes of this Strategy, 'risk assessment' involves the identification and description of hazards caused by invasive alien species, an evaluation of exposure (entry, establishment, spread and impacts) and a description of the risks involved. Risk assessment may include a consideration of which control measures would be the most cost-effective and feasible.

The concepts and stages of risk assessment are described in more detail in **Appendix III** to this strategy.



FINLAND'S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

ALIEN SPECIES IN FINLAND

A total of 45,000 to 50,000 species of organism are known to occur in Finland. The majority of these, about 22,500, are invertebrates; about 1,300 are vascular plants and about 400 are vertebrates. Out of all the species of organism found in Finland, just under 1,000 are alien species. This number is expected to grow as a result of the movement of people and goods and because of climate change. Of the alien species established in Finland, about 25 are marine species, 25 are freshwater species and 700 to 900 are land species; most of the latter are plants.

According to the national experts, in the beginning of 2011 there were a total of 157 invasive alien species permanently established in Finland which cause clearly identifiable, direct or indirect damage. At the moment, the vast majority of invasive alien species in Finland, about 108 species, are agricultural and forestry-related alien species that threaten the practice of agriculture and forestry and, in some cases, the natural environment. Of the remaining species, 5 occur in the territorial waters of Finland in the Baltic Sea, 6 are land vertebrates, 24 are plant species and 9 are indoor pests.

As at the beginning of 2011, about 123 potentially or locally harmful alien species had been identified in Finland; these are established alien species that may cause direct or indirect harm. The majority of these, more than 45 species, are agricultural and forestry-related alien species. About two thirds of the potentially or locally harmful alien species are already established in Finland.

According to background reports compiled by sub-groups during the preparation of the Strategy (Appendix V), the vast majority of alien species

enter Finland unintentionally as the result of human action. Agricultural and forestry-related alien species constitute by far the largest percentage of all alien species unintentionally introduced to Finland. By contrast, most of the freshwater alien species, alien land vertebrates and alien plants are intentionally imported, mainly for commercial purposes. Alien species in the Baltic Sea have mainly been introduced unintentionally. There are also numerous alien species whose migration to Finland is unknown.

The region of origin for the majority of alien species entering Finland is North America, followed by Asia (or more broadly Eurasia). However, data on time of entry and country of origin are not available for all species.

Invasive alien species and potentially or locally harmful alien species cause adverse ecological, economic, health or social impacts. For most invasive alien species, systematic measures to combat them or to mitigate the harm they cause are already in progress, particularly for those with impacts in agriculture and forestry; by contrast, measures to combat invasive alien species in the wild tend to be project-based.

This Strategy is based on a study of alien species in Finland during 2010 and early 2011, and the expert opinions quoted regarding the actual and potential harm caused by alien species are based on information available during that period. The lists of alien species will be amended as new information is gained, by adding or removing species or transferring them from one list to another. It should be noted that the lists of species do not pretend to be comprehensive or exclusive.

INVASIVE ALIEN SPECIES IN FINLAND

Invasive alien species in the Baltic Sea

It is estimated that 13 alien species have become established within Finland's territorial waters in the Baltic Sea, 5 of them invasive alien species and 8 of them potentially or locally harmful. There are a further 8 alien species that have so far not been found in Finland's territorial waters but are considered likely to spread to the Baltic Sea and therefore to Finland's territorial waters in the future.

All of the aforementioned invasive alien species have been unintentionally introduced to Finland by shipping, either with ballast water or attached to the hulls of vessels. Many of the potentially or locally harmful species have also entered with shipping.

The harm caused by invasive alien species in the Baltic Sea may be divided into two main categories. Sessile species such as the bay barnacle, mussels (dark false mussel and zebra mussel) and freshwater hydroid attach themselves firmly to the bottoms of boats, increasing friction and fuel consumption, and to a variety of underwater struc-

tures, causing problems for instance for power plants using sea water as a coolant. These sessile species and mobile species in the open water or on the sea bed alter their living environment and increase local competition for space and/or nutrition. The potentially or locally harmful alien species have the same sort of impacts as the above. Also, the Prussian carp may pose a threat to indigenous species through cross-breeding.

At the moment, there are no national or international provisions in place governing the combating the harm caused by invasive alien species in the Baltic Sea. In 2004, the International Maritime Organisation (IMO) adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, which lays down worldwide requirements for the handling of ballast water and thereby for the prevention of the spread of alien species with ballast water. This Convention has not yet entered into force. Finland initiated the process to ratify the Convention in 2009, and it is generally estimated that it will enter into force internationally in the near future. The EU has no legislation addressing the containment of the spread of organisms attached to ships' hulls or living in ballast water.

Invasive alien species in the Baltic Sea:

Bay barnacle

The bay barnacle (*Balanus improvisus*) entered the Baltic Sea back in the 1840s and has spread to the entire sea area except for the Bothnian Sea. It is a cirripede crustacean which must attach itself to a substrate to survive and procreate. It is harmful to boating when it attaches itself to the bottoms of boats, which increases friction and hence fuel consumption. Hence boat bottoms are treated with toxic chemicals to prevent barnacles from attaching to them.

The bay barnacle can also attach itself to rock. Having spread to the Baltic Sea, the bay barnacle has considerably altered its living environment along the coasts by displacing plants and other sessile animals.



PHOTO: MAIJU LEHTINIEMI

*Invasive and potentially or locally harmful alien species in the Baltic Sea***Invasive alien species in the Baltic Sea (5)**

FAUNA

Caspian polyp or freshwater hydroid
 Fishhook waterflea
 Red gilled mud worm (3 species)
 Bay barnacle
 Dark false mussel

Cordylophora caspia
Cercopagis pengoi
Marenzelleria spp.
Balanus improvisus
Mytilopsis leucophaeata



Invasive alien species in the Baltic Sea:

Fishhook waterflea (*Cercopagis pengoi*)

PHOTO: SOILI SAESMAA

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Potentially or locally harmful alien species in the Baltic Sea (16)

*= not found in Finnish territorial waters yet

FAUNA

Warty comb jelly*
 Prussian carp (also freshwater)
 Harris mud crab
 Round goby (also freshwater)
 Tubenose goby
 Chinese sleeper* (also freshwater)
 Asian clam*
 Quagga mussel*
 [amphipod]* (also freshwater)
 Tiger sideswimmer
 Zebra mussel
 Chinese mitten crab (also freshwater)
 Killer shrimp*
 [amphipod]*

Mnemiopsis leidyi
Carassius auratus m. *gibelio*
Rhithropanopeus harrisi
Apollonia (Neogobius) melanostomus
Proterorhinus marmoratus
Perccottus glenii
Corbicula fluminea
Dreissena bugensis
Gmelinoides fasciatus
Gammarus tigrinus
Dreissena polymorpha
Eriocheir sinensis
Dikergammarus villosus
Pontogammarus robustoides

FLORA

[dinoflagellate species]
 Canadian waterweed (also freshwater)

Prorocentrum minimum
Elodea canadensis



**Invasive alien species
in the Baltic Sea:**

Red gilled mud worm
(*Marenzelleria* spp.)

PHOTO: JAN-ERIK BRUUN



**Potentially or locally harmful alien species
in the Baltic Sea:**

Harris mud crab
(*Rhithropanopeus harrisi*)

PHOTO: MAIJU LEHTINIEMI

Invasive alien species in inland waterways

Alien species in Finland's inland waterways, whether intentionally introduced, released into the wild or otherwise having entered the country, comprise 24 fish, 4 crayfish or other invertebrates, 2 reptiles, 5 plants and 4 parasites or epibionts. Most of these have not become established, and only 5 of them are considered invasive alien species. A total of 17 of these species are classified as potentially or locally harmful, and 11 of these have been found in Finland.

Alien species of fish and two alien species of crayfish have been imported to Finland in past decades, mostly for stocking as part of fisheries management or for fish farming for food. Only a few of these species have established themselves in the natural environment; some are farmed for food or used for stocking pursuant to statutory fisheries obligations. Certain species have become important in Finland's fishing economy due to their status (e.g. the Peled or northern whitefish and the lake trout) and/or high economic value (e.g. the rainbow trout and the signal crayfish). The introduction of new species for fish farming is considered possible, albeit the importance of ex-ante risk assessment is stressed. Some of the populations of alien species in Finland's inland waterways originated with escapees, while others have spread through canals.

This Strategy addresses all alien species found in inland waterways, even though some of them more commonly occur in brackish water (such as the Chinese mitten crab). In the area of flora, wet-

land species are excluded. Two parasites causing harm in species in the wild are included, crayfish plague (two subtypes) and the eel swim bladder nematode. Aquarium fish and the legislation governing them were excluded from the preparation of this Strategy because no species of aquarium fish is known to be able to survive in Finland's natural environment, as they typically originate in tropical regions. However, risk assessment procedures for the release of aquarium species into the wild must be developed, as temperate-zone species are also kept in aquariums.

The import of fish and crayfish species for farming is governed by an EU Regulation (No. 798/2007), which is a business development regulation. Under the new provisions, roe of the inconnu (*Stenodus leucichthys*) was imported to Finland in spring 2010 for the purpose of raising a breeding stock for potential fish farming for food in a closed environment.



Invasive alien species in inland waters:

Reed sweetgrass
(*Glyceria maxima*)

PHOTO: TERHI RYTTÄRI

Invasive alien species that is also important for recreational fishing:

Brook trout

The brook trout (*Salvelinus fontinalis*) originates in the northern USA. It was introduced to Finland from Germany as early as in 1895, with subsequent introductions directly from the USA. The species has become established, its typical habitats being small-scale brooks and rivers from southern Finland up to Lapland. Some populations are quite dense.

The brook trout competes with and usually displaces the brown trout. It is not as demanding as the brown trout and is thus better suited for recreational fishing. This may be considered to some extent a social and economic benefit.

Introducing the brook trout to a new area is always subject to a license from the fisheries authorities, pursuant to section 121 of the Fishing Act. However, individual local fishermen may translocate brook trout from one water area to another. Research on the brook trout has been conducted in the headwaters of Kemijoki River in recent years.



If the spread of the brook trout to new water areas is not brought under control, the indigenous brown trout populations will continue to decline, with the loss of local populations. It is probably not possible to eradicate the brook trout except in very small ponds or similar closed systems.

PHOTO: LAURI URHO

Invasive and potentially or locally harmful alien species in inland waterways

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Invasive alien species in inland waterways (5)

FAUNA

Brook trout
Signal crayfish

Salvelinus fontinalis
Pacifastacus leniusculus

FLORA

Reed sweetgrass
Canadian waterweed (also brackish water)

Glyceria maxima
Elodea canadensis

FUNGAL DISEASES

Crayfish plague, type As and type Ps1

Aphanomyces astaci (As, Ps1)

Invasive alien water plant growing in dense masses:

Canadian waterweed

Canadian waterweed (*Elodea canadensis*) is an underwater plant species originating in North America. It spread to Europe in 1836, and a specimen was brought to the University of Helsinki botanical gardens in 1884. However, the species has probably entered Finland on multiple occasions. At this time, Canadian waterweed is common in southern Finland and the southern parts of central Finland, and it is spreading aggressively in the Koillismaa region in the north-east.

It thrives in alkaline, high-nutrient shallow lakes and inlets and in slowly flowing rivers. Only pistillate plants of the species have been observed in Europe, so it is assumed that it only propagates through vegetative reproduction: even a tiny bit of a sprout will quickly begin to grow if translocated. Under favourable circumstances, in low-nutrient alkaline lakes, the Canadian waterweed may



form dense masses that displace indigenous flora and cause considerable fluctuations in acidity.

The Canadian waterweed may spread from one waterway to another with boats, fishing equipment and probably also waterfowl. The spread of the species can be slowed down through education and public awareness.

PHOTO: SEPPO HELLSTEN

Potentially or locally harmful alien species that is also the most valuable fish in the Finnish economy:

Rainbow trout

The rainbow trout (*Onchorhynchus mykiss*) originated on the west coast of Canada and the USA, south of 60° N. Rainbow trout roe was first imported to Finland from Germany in 1894 and subsequently from several different countries, including directly from the USA.

The rainbow trout has been introduced to a number of countries where it has formed permanent populations competing with indigenous fish for space and food. In continental Europe and in the UK, populations breed regularly in many places, and southern Sweden has also had a permanent population since the 1950s. In Estonia, there is a suspicion that there is a regularly breeding population in the upper reaches of Pärnu River. Because of the above, the rainbow trout has been listed as one of the eight worst invasive alien species of fish in the world (World Conservation Union: Invasive Species Specialist Group).

There have been recent attempts to establish rainbow trout populations in Finnish waterways, but natural breeding has only occurred in the upper reaches of certain rivers in southern Finland. The rainbow trout is Finland's foremost fish species farmed for food, with a production value of EUR 37.9 million in 2009. The rainbow trout is



regularly used for stocking in quite large numbers at various put and take fisheries, and the species thus has recreational value. Stocking is also undertaken in unharnessed rapids, partly specifically because the rainbow trout does not readily breed in the wild in Finland and therefore the introduced fish cause as little disruption as possible and for as short a time as possible to local indigenous fish populations, above all to brown trout (*Salmo trutta*). However, they have been observed to eat roe and have been suspected of interfering with brown trout spawning, which would have a direct negative effect on brown trout populations.

The rainbow trout is classified as 'potentially or locally harmful' in Finland. This calls for closer monitoring and research into the potential but poorly known harmful impacts of the species. If the rainbow trout begins to breed regularly in Finland, or if monitoring and research data show that continuous stockings are seriously jeopardising the survival of the brown trout (classified as an endangered species south of the Arctic Circle), the classification of the species must be reconsidered.

PHOTO: LAURI URHO



Potentially or locally harmful alien species in inland waterways:

Lake trout
(*Salvelinus namaycush*)

PHOTO: LAURI URHO



Potentially or locally harmful alien species in inland waterways:

Danube crayfish
(*Astacus leptodactylus*)

PHOTO: JOUNI TOLONEN

Potentially or locally harmful alien species in inland waterways (17)

* = not found in Finland yet

FAUNA

Spinycheek crayfish*
Lake trout
Prussian carp (also brackish water)
Danube crayfish
Common carp
Rainbow trout
Humpback salmon
Marbled crayfish*
Round goby (also brackish water)
Peled whitefish
Chinese sleeper* (also brackish water)
[amphipod]* (also brackish water)
Chinese mitten crab (also brackish water)

Orconectes limosus
Salvelinus namaycush
Carassius aurelius gibelio
Astacus leptodactylus
Cyprinus carpio
Oncorhynchus mykiss
Oncorhynchus gorbuscha
Procambarus sp.
Neogobius melanostomus
Coregonus peled
Perccottus glenii
Gmelinoides fasciatus
Eriocheir sinensis

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FLORA

Soft hornwort
Western waterweed*
Fringed water lily*

Ceratophyllum submersum
Elodea nuttallii
Nymphoides peltata

NEMATODES

Eel swim bladder nematode

Anguillicola crassus

Invasive alien land vertebrate species

Some 30 alien land vertebrate species have established themselves in Finland. Of these, 6 are considered invasive alien species and 4 potentially or locally harmful. All of the invasive, potential or locally harmful species already occur in Finland except for the ruddy duck.

A clear majority of the alien land vertebrate species have been imported intentionally; about one in four have entered Finland as the unintentional consequence of human action. Alien land vertebrate species have mainly been imported to Finland and translocated within the country for commercial purposes: for game management or hunting, for fur farming or as pets. Most of the alien land vertebrate individuals found in the wild are escapees.

Feral cats are classified as an invasive alien land vertebrate species for the purposes of this discussion. Although cats entered Finland before 1850, the cut-off point for evaluation of whether species are indigenous, it is possible that climate change will contribute to an increase in feral and semi-feral populations in the wild in Finland. The domestic cat is on the list of 100 worst invasive alien species in the world.¹ The Finnish Hunting Act stipulates that provisions applying to unprotected

animals also apply to cats², although it should be noted that this specifically means feral cats. A cat may be considered feral when it obtains its food in the natural environment outside its home garden, i.e. lives in the wild.³ Domestic cats kept as pets are not unprotected; they are domestic animals and pets. Regarding cats kept as pets, the legislation states that they must not be abandoned⁴ or deserted and that owners must take care of their cats.⁵ The provisions regarding cats as pets must be further specified so as to reduce the harm caused by cats roaming free and possibly becoming feral. The aim is not, however, to restrict the keeping of cats as pets as such.

There is no single uniform piece of legislation in Finland concerning the combating of alien land vertebrate species clearly identified as invasive. The Nature Conservation Act contains general provisions on the limitation of the spreading of alien species, and the Hunting Act forbids the import and release into the wild of “bird or mammal species of foreign origin as well as game strains of foreign origin” without a permit, which “must be refused if significant harm will be caused by the measure to the natural environment or fauna”. Moreover, hunting is the exclusive right of the landowner, and hunting in urban areas is restricted.

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Invasive and potentially or locally harmful alien land vertebrate species

Invasive alien land vertebrate species (6)

North American beaver

Domestic cat (only when feral⁶)

[American] mink

Brown rat

Raccoon dog

European rabbit

Castor canadensis

Felis silvestris catus

Mustela vison

Rattus norvegicus

Nyctereutes procyonoides

Oryctolagus cuniculus

1. http://www.issg.org/worst100_species.html
2. Hunting Act, Section 5: Provisions concerning unprotected animals apply to a cat which has run wild.
3. Government Proposal 300/1992 and Metsästäjän lakikirja [Hunter's law book] 10/2010.
4. Decree implementing the European Convention for the Protection of Pet Animals / Treaties 49/1992: By a stray animal is meant a pet animal which either has no home or is outside the bounds of its owner's or keeper's household and is not under the control or direct supervision of any owner or keeper.
5. Hunting Act, Section 85.

6. Section 5 of the Hunting Act states that provisions concerning unprotected animals apply to a cat which has run wild. Metsästäjän lakikirja [Hunter's law book] 10/2010 states that a cat which has run wild is a cat which acquires its food in the natural environment outside its home household, i.e. is living as a wild animal. Domestic cats kept as pets are not unprotected; they are domestic animals and pets.



Invasive alien species:

Raccoon dog

(*Nyctereutes procyonoides*)

PHOTO: MARCUS WIKMAN



Potentially or locally harmful alien species:

Canada goose

(*Branta canadensis*)

PHOTO: MARCUS WIKMAN

Potentially or locally harmful alien land vertebrate species (4)

* = not found in Finland yet

Canada goose
Ruddy duck*
Muskrat
White-tailed deer

Branta canadensis
Oxyura jamaicensis
Ondatra zibethicus
Odocoileus virginianus

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There are certain other species whose farmed populations cause problems. Protective translocations of **lesser white-fronted goose** must not be made using farmed populations that have bred with other species of goose. Monitoring is required to observe whether a nesting population of **bar-headed goose** is emerging in Finland, and if so, it must be eradicated. An alien western strain of **grey partridge** has been introduced to Finland for hunting purposes. These introductions entail a risk of genetic mutation to the indigenous strain of grey partridge. Similarly, translocations of **mallard duck** in Sweden and elsewhere in Europe may contribute to a genetic mutation in Finnish populations of the same species, as migrating individuals from these translocated populations may enter Finland. Falcons escaping from falcon breeders in other countries may breed with threatened **peregrine falcon** and **gyrfalcon** individuals in Finland. There is a similar problem with **wolf-dog hybrids** and with cross-breeding between the **northern**

reindeer kept in reindeer husbandry and the **wild forest reindeer**.

Invasive alien land plants

There are an estimated 700 to 800 alien plant species occurring in the wild in Finland. Additionally, there is a high but unknown number of species of ornamental and useful plants grown in domestic gardens. For the purposes of the present discussion, 24 alien plant species are considered invasive alien species and 28 potentially or locally harmful. All of the invasive and potentially or locally harmful alien land plant species already occur in Finland except for the downy ryegrass (*Leymus innovatus*).

Classifying species as invasive or harmless is not unambiguous: some of the species are already widespread and their impacts are obvious, while

others only occur locally at the moment and are harmful only in specific habitats. It should also be remembered that even a plant classified as an invasive alien species may be a perfectly usable garden plant as long as it is restricted to the location where it was planted. Wind-spread and bird-spread species are the most difficult to control in this respect. Finland is a country whose extensive length from north to south means that there are very different climates and growing conditions in different parts of the country.

Most of the problems caused by alien plant species occur in southern Finland, and the marine climate of the archipelago in particular is home to many alien plants that cannot at present survive on the mainland or in the north. The sycamore maple (*Acer pseudoplatanus*) is one of these demanding alien species. Shores along waterways, sandy beaches and esker forests are particularly vulnerable habitats. They share a natural dynamic resulting in plenty of exposed ground where alien plants can take root.

There may be differences between strains of a species regarding how they propagate and how harmful they are. A good example of this is the Japanese rose (*Rosa rugosa*): its basic strain is aggressively spreading along shorelines in Finland, but there are also cultivated strains whose seed production and propagation capabilities are weaker. Because of such variation, drawing up the list of invasive alien plants was not easy, and the distinction between invasive and potentially harmful species is sometimes unclear. Also, the Finnish flora is constantly changing, and the list must be regularly updated. The list of potentially or locally harmful alien plants in particular is indicative at best, and garden plant escapees require constant vigilance.

With plants, as indeed with other organisms, identifying the early stages of an invasion is very difficult. Individual escapees may seem harmless for quite a long time until the population acquires sufficient numbers for propagation to pick up speed. This is what happened with the Japanese rose. The species existed in the wild in Finland for decades before the population acquired critical mass to trigger exponential growth. Evaluating and predicting whether tree species are harmful is also difficult, as trees are extremely long-lived and most alien species of trees in Finland have a rather short history.

In the long term, climate change will affect how alien plants survive and spread. Species that currently do not weather Finland's winter well may come to thrive in the future. Plants listed as invasive alien species in central Europe include many species that grow poorly or not at all in Finland's current climate. Examples of these are the black locust or false acacia (*Robinia pseudoacacia*), black cherry (*Prunus serotina*), box elder (*Acer negundo*), tree of heaven (*Ailanthus altissima*) and stag horn sumac (*Rhus typhina*), listed as invasive alien species in several European countries. On the website of a Finnish garden shop, the stag horn sumac is described as a tall shrub that propagates by root sprouts, grows on sunny, sandy slopes and has berries that birds eat. This indicates that the species might well spread for instance to eskers.

Alien plants cause a wide range of problems. Invasive alien plants are generally large and grow aggressively, produce a lot of seeds and quickly displace indigenous species in the wild. The large-leaved lupine, for instance, is a robust competitor that fertilises the soil in which it grows through nitrogen fixation. Hogweeds are in a destructive class of their own: they compete aggressively with indigenous Finnish flora, cause health hazards to humans and may even lower the value of properties. Dominating the landscape, they may also be considered aesthetically and culturally harmful for instance in heritage landscapes or otherwise valuable locations. Many weeds of arable land do not spread into the wild but nevertheless cause significant economic harm in the form of herbicide costs and decreased crop yields.

Plants spread through human action in many ways. Transport is a significant contributor to plant migration, and roadside grass planting introduces plants to the natural environment as a by-product. Plant species have entered Finland with hayseeds and cattle feed. Wartime entries of non-native species and seeds carried in ballast sand are separate groups. Birds carry seeds of berry-producing plants. A large number of the alien plant species now considered invasive were imported as ornamental plants for gardens and parks, and many weeds were unintentionally imported with these. Travellers bring new plant species with them from abroad, and the Internet is a significant tool in the plant trade and in the exchange of plants between enthusiasts. Earth moving and topsoil removal also translocate plants. The inappropriate and careless disposal of garden waste is one of the greatest problems in this area.

Section 43 of the Nature Conservation Act states that “non-native plant species [...] are not to be planted or sown outside a garden, field or other site designated for special purposes, nor in natural waters, in so far as there is cause to suspect that the species may become established permanently”. This provision is little known and poorly enforced. Finnish legislation does not allow for the combating of invasive alien plants without the landowner's permission, even in a nature reserve. The free trade in garden plants within the EU also poses a challenge for control of invasive alien plants.

Legislation concerning the seed trade specifies threshold values for percentages of weed seeds and contains provisions regarding seed-spread diseases. However, the seed trade legislation does not provide for percentages of seeds of alien plants that have been determined invasive alien species.



Invasive alien species:

Japanese knotweed
(*Fallopia japonica*)

PHOTO: TERHI RYTTÄRI

Invasive and potentially or locally harmful alien land plant species

Invasive alien land plant species (24)

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American willowherb	<i>Epilobium adenocaulon</i>
Fringed willowherb	<i>Epilobium ciliatum</i>
Common butterbur	<i>Petasites hybridus</i>
Running shadbush	<i>Amelanchier spicata</i>
Japanese knotweed	<i>Fallopia japonica</i>
Giant knotweed	<i>Fallopia sachalinensis</i>
Hybrid knotweed	<i>Fallopia × bohemica</i>
Himalayan balsam	<i>Impatiens glandulifera</i>
Orange jewelweed	<i>Impatiens capensis</i>
Small balsam	<i>Impatiens parviflora</i>
Giant hogweed	<i>Heracleum mantegazzianum</i>
Persian hogweed	<i>Heracleum persicum</i>
Sosnowsky's hogweed	<i>Heracleum sosnowskyi</i>
Canada goldenrod	<i>Solidago canadensis</i>
Tall goldenrod	<i>Solidago altissima</i>
Giant goldenrod	<i>Solidago gigantea</i>
Hedge bindweed	<i>Calystegia sepium</i>
Large-leaved lupin	<i>Lupinus polyphyllus</i>
Japanese rose (basic strain)	<i>Rosa rugosa</i>
White bedstraw; hybrid bedstraw	<i>Galium album; G. × pomeranicum</i>
Common Michaelmas daisy	<i>Aster × salignus</i>
Red elderberry	<i>Sambucus racemosa</i>
Wild oat	<i>Avena fatua</i>
Creeping yellow cress	<i>Rorippa sylvestris</i>

Invasive alien plant threatening sandy beaches and dunes:

Japanese rose

The Japanese rose (*Rosa rugosa*) originated on the Asian shores of the Pacific Ocean. Being hardy, it is a popular ornamental plant as individual shrubs and as mass plantings on roadsides. It spreads very efficiently: its hips can float on water for long periods, its seeds are spread by birds even to distant islands, and in sandy soil it forms extensive, dense thickets through rhizomes. The Japanese rose is a threat to ecosystems on sandy beaches and dunes all around the Baltic Sea. In Finland, the Japanese rose is the most abundant on the sandy beaches and esker islands of the Gulf of Finland. In the Gulf of Bothnia, it is only starting to spread. In addition to the ecological harm they cause, extensive Japanese rose thickets may impede recreational use and thereby lower the value of shoreline properties.



PHOTO: TERHI RYTTÄRI

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Invasive alien plant that displaces roadside meadows:

Large-leaved lupine

The impressive-looking large-leaved lupine (*Lupinus polyphyllos*) was imported to Europe from North America. Within a few decades, it has spread along roadsides and railway lines to the whole of southern Finland, up to Rovaniemi.

The large-leaved lupine is an aggressive competitor that quickly displaces declining meadow flora that have found a refuge in roadside meadows. Being a legume, the large-leaved lupine has bacteria in its roots that bind nitrogen and fertilise the soil, which further incapacitates the indigenous meadow flora.

The large-leaved lupine is difficult to eradicate. Recently it has been found to have spread from roadsides to meadows and esker forests.



PHOTO: TERHI RYTTÄRI

Invasive species of wetlands and wooded shores:

Himalayan balsam

The Himalayan balsam (*Impatiens glandulifera*) is an alien species which has spread from gardens to nature, where it spreads and occupies more space, smothering all other vegetation. The plant spreads easily in wetlands and wooded shores along riversides and brooks.



PHOTO: TERHI RYTTÄRI

Locally harmful alien plant:**Cultivated apple**

The common-or-garden apple tree (*Malus domestica*) is not something that one would immediately suspect of being a harmful alien species, and indeed generally speaking it is not. But on Åland and in the south-western archipelago there are populations of the indigenous European wild apple (*Malus sylvestris*), on the very northern fringes of its distribution range. Classified as vulnerable, the European wild apple is threatened by cross-breeding with the cultivated apple. Indeed, most of the remaining European wild apple individuals are already hybrids.

Potentially or locally harmful alien land plant species (28)

Nootka lupine	<i>Lupinus nootkatensis</i>
Downy ryegrass	<i>Leymus innovatus</i>
Aleutian ragwort	<i>Senecio cannabifolius</i>
White dogwood	<i>Cornus alba</i> ssp. <i>alba</i>
Red-osier dogwood	<i>Cornus alba</i> ssp. <i>stolonifera</i>
Giant butterbur	<i>Petasites japonicus</i> ssp. <i>giganteus</i>
Western red cedar	<i>Thuja plicata</i>
Yellow skunk cabbage	<i>Lysichiton americanus</i>
Common ragweed	<i>Ambrosia artemisiifolia</i>
Siberian fir	<i>Abies sibirica</i>
Balsam fir	<i>Abies balsamea</i>
Pin cherry	<i>Prunus pensylvanica</i>
Broad-leaved meadow grass	<i>Poa chaixii</i>
Fodder galega	<i>Galega orientalis</i>
Comfrey	<i>Symphytum</i> var. <i>officinale</i> and var. <i>bohemicum</i>
Russian comfrey	<i>Symphytum</i> × <i>uplandicum</i>
Cultivated apple	<i>Malus domestica</i>
Sycamore maple	<i>Acer pseudoplatanus</i>
Barren brome	<i>Bromus sterilis</i>
Cocks spur grass	<i>Echinochloa crus-galli</i>
Canadian horseweed	<i>Conyza canadensis</i>
Scarlet pimpernel	<i>Anagallis arvensis</i>
Black-grass	<i>Alopecurus myosuroides</i>
Red poppy	<i>Papaver rhoeas</i>
Yellow foxtail	<i>Setaria pumila</i>
Green foxtail	<i>Setaria viridis</i>
Red-root amaranth	<i>Amaranthus retroflexus</i>
False spiraea	<i>Sorbaria sorbifolia</i>

Alien species in agriculture and forestry, and indoor pests

Most of the alien species in agriculture and forestry are plant pests, meaning harmful organisms (flora or fauna) – whether fungi, bacteria, phytoplasms or viruses – that infest plants or plant products and that can cause direct or indirect harm to crops, natural plants or products derived from either of them. However, this category also includes a number of organisms beneficial to plant production.

Some alien species of plant pests are quarantine species (Table 7), the import and spreading of which is prohibited by Directive in all EU Member States or for specific protected zones. Quarantine pests are classified as particularly harmful alien species requiring immediate action, and there are internationally agreed robust prevention measures already in place for them.

Of the invasive and potentially or locally harmful alien species identified in Finland, the majority occur in agriculture and forestry, 108 of them being considered invasive; 45 are classified as potentially or locally harmful, and 13 of these have been found in Finland. Statutory or voluntary preventive measures may also be aimed at other plant pests besides quarantine species.

Of the alien species identified in agriculture and forestry, 68 have already migrated into the wild or would most probably do so if they entered Finland. Experts estimate 20 of these species to be such that they could cause significant destruction of flora or fauna. In reality, the extent and nature of the impact of these invasive alien species on biodiversity is difficult to assess, because their impacts have only been studied from the perspective of plant production. A plant pest may have any number of host plants. A well-known example of plant pests are the molds of the genus *Phytophthora*, which spread for instance through the plant trade and which are known to cause harm to forests and vegetation. The incidence and severity of damage caused by plant pests is always dependent on climate conditions and the properties of the host plant, such as its toughness and population structure. Interaction relationships between organisms are complex; many of the plant pests on the invasive alien species list, such as aphids, are themselves bearers of viruses, phytoplasms or fungi and therefore spreaders of plant diseases.

Alien plant pest species are addressed in Finnish legislation in the Act on Protecting Plant Health (702/2003), the Plant Propagation Material Act (also known as the Seedlings Act, 1205/1994), the Seed Trade Act (728/2000) and the Forest Insect and Fungi Damage Prevention Act (263/1991). Most of the invasive alien species in agriculture and forestry are covered by legislation, which means that existing legislation, enhanced monitoring and risk assessment at the EU level and in Finland are key points for development.

Various beneficial organisms are used in plant production for instance for pollination and biological pest control. In Finland, biological pest control is mainly used in greenhouses, but also in outdoor applications such as strawberry farming. The beneficial organisms used for biological pest control are often alien species not found in Finland's natural environment. There is no legislation whatsoever regarding the production, import or use of such beneficial organisms. Before Finland's EU membership, importers had to request statements from the authorities concerning their safety, but these were not legally binding.

Alien insect species outside agriculture and horticulture, indoor pests

Of the alien insect species described as indoor pests, 9 are considered invasive and 18 potentially or locally harmful. Alien indoor insect species have generally entered Finland unintentionally with foods, textiles, wood items, timber or travellers. Many of these species originate in warm or moderate climates, and their survival indoors depends on a steady and sufficiently high indoor temperature.

Food pests infest central warehouses and grain mills. They find their way into food cupboards in households too, usually in a contaminated product. They generally prompt disgust when discovered in a household. Pests ruin the foods they infest with their faeces. Textile pests feed on wool, fur and feathers, causing holes to appear in fabrics.

Particularly harmful alien species, pest:**Spanish slug**

The first sighting in Finland of the Spanish slug (*Arion lusitanicus*), a particularly harmful alien species, dates from 1990. In Sweden, the species had been found as early as in 1975. Today, it is known to have established a very strong population in Sweden and on Åland. In Finland, the species has been found at some 300 different locations, and it is known to have spread as far as Kiiminki in the north, Kajaani in the north-east and Juuka in the east.

The Spanish slug is an omnivorous colony species that has adapted to Finland's cool climate. An individual slug may roam as much as 50 m in a night, and it usually eats its own weight in food (10 g) per day. The Spanish slug eats plants in gardens and fields, causing significant economic damage. The Spanish slug may also cross-breed with other slugs, causing ecological damage to the indigenous species.



The species has probably entered Finland through market gardens and soil suppliers in plant propagation materials and mulch. It continues to spread through amateur gardening and plant translocation. Climate change is increasing population size in northern cultivated areas and therefore the damage caused by the species, further exacerbating the hazard to plant production. Experts agree that action to combat the species is at least 10 years late, perhaps unrecoverably.

PHOTO: ILMARI VALOVRTA

Invasive and potentially or locally harmful alien species of agriculture and forestry, and indoor pests

Invasive alien species of agriculture and forestry (108)

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* = may migrate to the natural environment, impact unknown or probably negligible

** = may migrate to the natural environment, impact may be significant

INSECTS

Greenhouse whitefly**	<i>Trialeurodes vaporariorum</i>
Potato aphid*	<i>Macrosiphum euphorbiae</i>
Greenhouse thrips	<i>Heliethrips haemorrhoidalis</i>
Oleander scale	<i>Aspidiotus nerii (syn. hederæ)</i>
[hawthorn psyllid]*	<i>Cacopsylla melanoneura</i>
Western flower thrips*	<i>Frankliniella occidentalis</i>
Crescent-marked lily aphid	<i>Aulacorthum circumflexum</i>
European pepper moth	<i>Duponchelia fovealis</i>
Long-tailed mealybug	<i>Pseudococcus longispinus</i>
Glasshouse potato aphid*	<i>Aulacorthum solani</i>
Cotton aphid	<i>Aphis gossypii</i>
Scarlet lily beetle**	<i>Lilioceris lili</i>
Chrysanthemum aphid	<i>Macrosiphoniella sanborni</i>
Banded greenhouse thrips	<i>Hercinothrips femoralis</i>
[predatory mirid bug]*	<i>Nesidiocoris tenuis</i>
Brown soft scale	<i>Coccus hesperidum</i>
Hemispherical scale	<i>Saissetia coffeae</i>
Green peach aphid**	<i>Myzus persicae</i>
Pear leaf-curling midge	<i>Dasineura pyri</i>
Emerald ash borer**	<i>Agrilus planipennis</i>
Fern scale	<i>Pinnaspis aspidistrae</i>
Shallot aphid	<i>Myzus ascalonicus</i>
Palm thrips	<i>Parthenothrips dracaenae</i>

Black vine weevil**

Citrus mealybug

Otiorhynchus sulcatus

Planococcus citri

BACTERIA AND PHYTOPLASMA

Bacterial blight

Bacterial canker

Halo blight of oats

Potato blackleg*

Potato blackleg*

Pseudomonas syringae

Clavibacter michiganensis, ssp. *michiganensis*

Pseudomonas syringae

Dickeya dianthicola and other new *Dickeya* species

Pectobacterium carotovorum

MITES

Broad mite

Polyphagotarsonemus latus

FUNGI

Blight**

Rhodocline needlecast*

Poplar leaf blight

Diaporthe vaccinii

Rhodocline pseudotsugae

Drepanopeziza populorum,
anamorfi *Marssonina populi*

Hypoxylon canker of aspen**

Silver scurf

Root dieback in conifer seedlings

Powdery mildew of gooseberry

Halo blight of oats

Loose smut of oats

Bark canker**

Wilt

European larch canker

Nectria canker*

Alder rust**

Black spot of strawberry*

Strawberry leather rot**

Foliar rust*

Black rust*

Take-all*

Take-all

Anthraxnose ripe rot

Spot blotch and common root rot of barley*

Loose smut of barley

Barley leaf scald*

Net blotch of barley*

Barley stripe

Powdery mildew of apples

Clubroot of crucifers*

Apple bark rot

White mold*

Downy mildew of Impatiens

Leaf blotch disease of potato

Potato blight (sexual reproduction)

Potato blight (asexual reproduction)

Potato stem canker*

Phytophthora disease*

Tan spot*

Downy mildew

Carrot rot

Liquorice rot of carrot*

Pink rot of potato

Entoleuca mammata

Helminthosporium solani

Ceratobasidium bicorne

Podosphaera mors uvae

Pyrenophora chaetomioides

Ustilago avenae

Neofabraea populi

Verticillium albo-atrum/V. dahliae

Lachnelulla willkommii

Nectria galligena

Melampsorium hiratsukanum

Colletotrichum acutatum

Phytophthora cactorum

Melampsora larici-populina

Puccinia graminis

Gaeumannomyces graminis var. *tritici*

Gaeumannomyces graminis var. *avenae*

Colletotrichum coccoides

Cochliobolus sativus

Ustilago nuda f.sp. *hordei*

Rhynchosporium secalis

Pyrenophora teres

Pyrenophora graminea

Podosphaera leucotricha

Plasmodiophora brassicae

Phytophthora cactorum

Sclerotinia sclerotiorum

Plasmopara obducens

Cercospora concors (*Mycovellosiella*)

Phytophthora infestans

Phytophthora infestans

Rhizoctonia solani, AG3

Phytophthora plurivora

Pyrenophora tritici-repentis

Plasmopara halstedii

Phytophthora porri

Mycocentrospora acerina

Phytophthora erythroseptica

Red band needle blight*	<i>Mycosphaerella pini</i>	
Ramularia leaf spot	<i>Ramularia collo-cygni</i>	
<i>Stagonospora nodorum</i> blotch*	<i>Stagonospora nodorum</i>	
Ash dieback**	<i>Chalara fraxinea</i>	
Water rot*	<i>Pythium ultimum</i> , <i>Pythium debaryanum</i>	
Seedling blight, sheath blight*	<i>Rhizoctonia solani</i> AG2-1, AG 2-2	
Ergot*	<i>Claviceps purpurea</i>	
Cedar leaf blight	<i>Didymascella thujina</i>	
Collar rot, fusariosis*	<i>Fusarium</i> spp.	
Eye spot*	<i>Oculimacula yallundae</i>	
Kernel fusariosis	<i>Fusarium langsethiae</i>	
Common bunt of wheat	<i>Tilletia caries</i>	
Common bunt of wheat	<i>Tilletia laevis</i>	
Loose smut of wheat	<i>Ustilago tritici</i>	
MOLLUSCS		
Spanish slug**	<i>Arion lusitanicus</i>	
Orange-banded arion**	<i>Arion fasciatus</i>	
Banded slug or three-band garden slug	<i>Lehmanna valentiana</i>	
VIRUSES		
Hosta virus X (HVX)	<i>Hosta virus X (HVX)</i>	
Poinsettia mosaic virus (PnMV)	<i>Poinsettia mosaic virus (PnMV)</i>	
Cherry leaf roll virus (CLRV)*	<i>Cherry leaf roll virus (CLRV)</i>	
Cucumber mosaic virus (CMV)	<i>Cucumber mosaic virus (CMV)</i>	
Cucumber green mottle mosaic virus (CGMMV)	<i>Cucumber green mottle mosaic virus (CGMMV)</i>	
Black currant reversion virus (BRV)*	<i>Black currant reversion virus (BRV)</i>	
Apple chlorotic leaf spot virus (ACLV)	<i>Apple chlorotic leaf spot virus (ACLV)</i>	57
Pepino mosaic virus (PepMV)	<i>Pepino mosaic virus (PepMV)</i>	
Apple chlorotic leaf spot virus (ACLV)	PVX, PVM, PVS, PVA	
Potato mop top virus (PMTV)*	<i>Potato mop top virus (PMTV)</i>	
Potato virus Y (PVY)	<i>Potato virus Y (PVY)</i>	
Leek yellow stripe virus (LYSV)	<i>Leek yellow stripe virus (LYSV)</i>	
Shallot latent virus (SLV)	<i>Shallot latent virus (SLV)</i>	
Onion yellow dwarf virus (OYDV)	<i>Onion yellow dwarf virus (OYDV)</i>	
Tobacco mosaic virus (TMV)	<i>Tobacco mosaic virus (TMV)</i>	
Tobacco necrosis virus (TNV)	<i>Tobacco necrosis virus (TNV)</i>	
Raspberry bushy dwarf virus (RBDV)*	<i>Raspberry bushy dwarf virus (RBDV)</i>	
Wheat dwarf virus (WDV)*	<i>Wheat dwarf virus (WDV)</i>	
NEMATODES		
Sugarbeet nematode	<i>Heterodera schachtii</i>	
Invasive alien indoor pest species (9)		
Pharaoh ant	<i>Monomorium pharaonis</i>	
Indian meal moth	<i>Plodia interpunctella</i>	
Mediterranean flour moth	<i>Ephestia kuehniella</i>	
Odd beetle	<i>Thylogdrias contractus</i>	
Dermestid beetle	<i>Reesa vespulae</i>	
Sawtoothed grain beetle	<i>Oryzaephilus surinamensis</i>	
Destructive flour beetle	<i>Tribolium destructor</i>	
Clothing moth	<i>Tineola bisselliella</i>	
Fur beetle	<i>Attagenus woodroffei</i>	

Potentially or locally harmful alien species in agriculture and forestry (45)

* = may migrate to the natural environment, impact unknown or probably negligible

** = may migrate to the natural environment, impact may be significant

*** = not found in Finland yet

INSECTS

Poinsettia thrips	<i>Echinothrips americanus</i>
Multicoloured Asian lady beetle**/**	<i>Harmonia axyridis</i>
Leafhopper*	<i>Iguttetix oculatus</i>
Cotton bollworm**/**	<i>Helicoverpa armigera</i>
Ligurian leafhopper**/**	<i>Eupteryx decemnotata</i>
Aphid***	<i>Illinoia azaleae</i>
Horse-chestnut leaf miner	<i>Cameraria ohridella</i>
Yellow rose aphid***	<i>Rhodobium porosum</i>
[hawthorn psyllid]	<i>Psylla buxi</i>
Fringed orchid aphid***	<i>Cerataphis orchidearum</i>
Tulip bulb aphid***	<i>Dysaphis tulipae</i>
Greedy scale***	<i>Hemiberlesia rapax</i>
Purple scale**/**	<i>Lepidosaphes beckii</i>
Fig scale**/**	<i>Lepidosaphes conchiformis</i>
Hellebore aphid***	<i>Macrosiphum hellebori</i>
Mangold aphid***	<i>Rhopalosiphoninus staphyleae</i>
Apple grass aphid**/**	<i>Rhopalosiphum insertum</i>
Rice root aphid**/**	<i>Rhopalosiphum rufiabdominale</i>
Buff-tailed bumblebee*	<i>Bombus terrestris</i>
Greenfly***	<i>Coloradoa rufomaculata</i>
Red scale***	<i>Aonidiella aurantii</i>
Mirid bug**/**	<i>Dichroscytus gustavi</i>
Corn leaf aphid**/**	<i>Rhopalosiphum maidis</i>
Strawberry aphid***	<i>Chaetosiphon fragaefolii</i>
Bark beetles**	<i>Scolytus</i> spp.
South American tomato moth***	<i>Tuta absoluta</i>
Black olive scale***	<i>Saissetia oleae</i>
Violet aphid**/**	<i>Myzus ornatus</i>
Douglas-fir seed chalcid***	<i>Megastigmus spermotrophus</i>
Anthurium thrips***	<i>Chaetanaphothrips orchidii</i>
Lily thrips***	<i>Liothrips vaneeckei</i>
Begonia thrips***	<i>Scirtothrips longipennis</i>
Siberian conifer silk moth**/**	<i>Dendrolimus</i> spp.

FUNGI

Dutch elm disease**/**	<i>Ophiostoma ulmi</i> , <i>Ophiostoma novo-ulmi</i>
Cephalosporium stripe	<i>Hymenula cerealis</i>
Leaf spot	<i>Alternaria alternata</i>
Fruit rot***	<i>Fusicoccum putrefaciens</i>
Brown spot needle blight of pine**/**	<i>Mycosphaerella dearnessii</i>
Covered smut of barley	<i>Ustilago hordei</i>
Pitch canker**/**	<i>Gibberella circinata</i>
Septoria tritici blotch	<i>Mycosphaerella graminicola</i>

VIRUSES

Apple mosaic virus (ApMV)*	<i>Apple mosaic virus</i> (ApMV)
Tobacco rattle virus (TRV)*	<i>Tobacco rattle virus</i> (TRV)

MITES

Red spider mite*/***
Tomato russet mite

Tetranychus evansi
Aculops lycopersici

Potentially or locally harmful alien indoor pest species (18)

*** = not found in Finland yet

Red-legged ham beetle	<i>Necrobia rufipes</i>
American cockroach	<i>Periplaneta americana</i>
Australian cockroach	<i>Periplaneta australasiae</i>
Confused flour beetle	<i>Tribolium confusum</i>
Auger beetles	Bostrichidae
Khapra beetle***	<i>Trogoderma granarium</i>
Merchant grain beetle	<i>Oryzaephilus mercator</i>
House cricket	<i>Acheta domesticus</i>
Bread beetle	<i>Stegobium paniceum</i>
Rusty grain beetle	<i>Cryptolestes ferrugineus</i>
Bean weevil	<i>Acanthoscelides obtectus</i>
Powder post beetle	<i>Lyctus africanus</i>
Long-horned beetle	<i>Stromatium unicolor</i>
Brown-banded cockroach	<i>Supella longipalpa</i>
Common cockroach	<i>Periplaneta orientalis</i>
Brown carpet beetle	<i>Attagenus smirnovi</i>
Varied carpet beetle	<i>Anthrenus verbasci</i>
Firebrat	<i>Lepismodes inquilinus</i>

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Table 4: Number of invasive alien species occurring in Finland and potentially or locally harmful alien species in Finland.

	Invasive alien species occurring in Finland	Potentially or locally harmful alien species in Finland	
		Total	Not found in Finland yet
Alien species in the Baltic Sea	5	16	8
Alien species in inland waterways	5	17	6
Alien land vertebrate species	6	4	1
Alien land plants	24	28	-
Alien species in agriculture and forestry	108	45	32
Alien indoor pest species	9	18	1

LIST OF INVASIVE ALIEN SPECIES OCCURRING IN FINLAND

Table 5: Invasive alien species occurring in Finland.

Invasive alien species in Finland (157)

* = particularly harmful invasive alien species

BACTERIA AND PHYTOPLASMA

Bacterial blight	<i>Clavibacter michiganensis</i> , ssp. <i>michiganensis</i>
Bacterial blight	<i>Pseudomonas syringae</i>
Halo blight of oats	<i>Pseudomonas syringae</i>
Potato blackleg	<i>Dickeya dianthicola</i> and other new <i>Dickeya</i> species
Potato blackleg	<i>Pectobacterium carotovorum</i>

VIRUSES

Hosta virus X (HVX)	<i>Hosta virus X</i> (HVX)
Poinsettia mosaic virus (PnMV)	<i>Poinsettia mosaic virus</i> (PnMV)
Cherry leaf roll virus (CLRV)	<i>Cherry leaf roll virus</i> (CLRV)
Cucumber mosaic virus (CMV)	<i>Cucumber mosaic virus</i> (CMV)
Cucumber green mottle mosaic virus (CGMMV)	<i>Cucumber green mottle mosaic virus</i> (CGMMV)
Black currant reversion virus (BRV)	<i>Black currant reversion virus</i> (BRV)
Apple chlorotic leaf spot virus (ACLV)	<i>Apple chlorotic leaf spot virus</i> (ACLV)
Pepino mosaic virus (PepMV)	<i>Pepino mosaic virus</i> (PepMV)
Potato leaf viruses PVX, PVM, PVS, PVA	PVX, PVM, PVS, PVA
Potato mop top virus (PMTV)	<i>Potato mop top virus</i> (PMTV)
Potato virus Y (PVY)	<i>Potato virus Y</i> (PVY)
Leek yellow stripe virus (LYSV)	<i>Leek yellow stripe virus</i> (LYSV)
Shallot latent virus (SLV)	<i>Shallot latent virus</i> (SLV)
Onion yellow dwarf virus (OYDV)	<i>Onion yellow dwarf virus</i> (OYDV)
Tobacco mosaic virus (TMV)	<i>Tobacco mosaic virus</i> (TMV)
Tobacco necrosis virus (TNV)	<i>Tobacco necrosis virus</i> (TNV)
Raspberry bushy dwarf virus (RBDV)	<i>Raspberry bushy dwarf virus</i> (RBDV)
Wheat dwarf virus (WDV)	<i>Wheat dwarf virus</i> (WDV)

FUNGI

<i>Rhabdocline</i> needlecast	<i>Rhabdocline pseudotsugae</i>
Hypoxylon canker of aspen	<i>Entoleuca mammata</i>
Silver scurf	<i>Helminthosporium solani</i>
Root dieback in conifer seedlings	<i>Ceratobasidium bicorne</i>
Powdery mildew of gooseberry	<i>Podosphaera mors uvae</i>
Halo blight of oats	<i>Pyrenophora chaetomioides</i>
Loose smut of oats	<i>Ustilago avenae</i>
Blight	<i>Diaporthe vaccinii</i>
Poplar leaf blight	<i>Drepanopeziza populorum</i> , anamorfi <i>Marssonina populi</i>
Bark canker	<i>Neofabraea populi</i>
Wilt	<i>Verticillium albo-atrum/V. dahliae</i>
European larch canker	<i>Lachnelulla willkommii</i>
Nectria canker	<i>Nectria galligena</i>
Alder rust	<i>Melampsorium hiratsukanum</i>
Black spot of strawberry	<i>Colletotrichum acutatum</i>
Strawberry leather rot	<i>Phytophthora cactorum</i>
Downy mildew	<i>Plasmopara halstedii</i>
Black rust	<i>Puccinia graminis</i>

Take-all	<i>Gaeumannomyces graminis</i> var. <i>tritici</i>
Take-all	<i>Gaeumannomyces graminis</i> var. <i>avenae</i>
Anthraxnose ripe rot	<i>Colletotrichum coccoides</i>
Spot blotch and common root rot of barley	<i>Cochliobolus sativus</i>
Loose smut of barley	<i>Ustilago nuda</i> f.sp. <i>hordei</i>
Barley leaf scald	<i>Rhynchosporium secalis</i>
Net blotch of barley	<i>Pyrenophora teres</i>
Barley stripe	<i>Pyrenophora graminea</i>
Powdery mildew of apples	<i>Podosphaera leucotricha</i>
Apple bark rot	<i>Phytophthora cactorum</i>
White mold	<i>Sclerotinia sclerotiorum</i>
Downy mildew of Impatiens	<i>Plasmopara obducens</i>
Leaf blotch disease of potato	<i>Cercospora concors</i> (<i>Mycovellosiella</i>)
Potato blight (sexual reproduction)	<i>Phytophthora infestans</i>
Potato blight (asexual reproduction)	<i>Phytophthora infestans</i>
Potato stem canker	<i>Rhizoctonia solani</i> , AG3
Tan spot	<i>Pyrenophora tritici-repentis</i>
Carrot rot	<i>Phytophthora porri</i>
Liquorice rot of carrot	<i>Mycocentrospora acerina</i>
Pink rot of potato	<i>Phytophthora erythroseptica</i>
Red band needle blight	<i>Mycosphaerella pini</i>
Ramularia leaf spot	<i>Ramularia collo-cygni</i>
Crayfish plague, type As and type Ps1*	<i>Aphanomyces astaci</i> (As, Ps1)
Clubroot of crucifers	<i>Plasmodiophora brassicae</i>
Foliar rust	<i>Melampsora larici-populina</i>
<i>Staganospora nodorum</i> blotch	<i>Stagonospora nodorum</i>
<i>Phytophthora</i> disease	<i>Phytophthora plurivora</i>
Ash dieback	<i>Chalara fraxinea</i>
Water rot	<i>Pythium ultimum</i> , <i>Pythium debaryanum</i>
Seedling blight, sheath blight	<i>Rhizoctonia solani</i> AG2-1, AG 2-2
Ergot	<i>Claviceps purpurea</i>
Cedar leaf blight	<i>Didymascella thujina</i>
Collar rot, fusariosis	<i>Fusarium</i> spp.
Eye spot	<i>Oculimacula yallundae</i>
Kernel fusariosis	<i>Fusarium langsethiae</i>
Common bunt of wheat	<i>Tilletia caries</i>
Common bunt of wheat	<i>Tilletia laevis</i>
Loose smut of wheat	<i>Ustilago tritici</i>
TRACHEOBIONTA	
Running shadbush	<i>Amelanchier spicata</i>
Common Michaelmas daisy	<i>Aster × salignus</i>
Wild oat	<i>Avena fatua</i>
Hedge bindweed	<i>Calystegia sepium</i>
Canadian waterweed (also freshwater)	<i>Elodea canadensis</i>
American willowherb	<i>Epilobium adenocaulon</i>
Fringed willowherb	<i>Epilobium ciliatum</i>
Japanese knotweed	<i>Fallopia japonica</i>
Giant knotweed	<i>Fallopia sachalinensis</i>
Hybrid knotweed	<i>Fallopia × bohémica</i>
White bedstraw; hybrid bedstraw	<i>Galium album</i> ; <i>G. × pomeranicum</i>
Reed sweetgrass	<i>Glyceria maxima</i>
Persian hogweed*	<i>Heracleum persicum</i>
Giant hogweed*	<i>Heracleum mantegazzianum</i>
Sosnowsky's hogweed*	<i>Heracleum sosnowskyi</i>

Orange jewelweed	<i>Impatiens capensis</i>
Himalayan balsam	<i>Impatiens glandulifera</i>
Small balsam	<i>Impatiens parviflora</i>
Large-leaved lupine	<i>Lupinus polyphyllus</i>
Common butterbur	<i>Petasites hybridus</i>
Creeping yellow cress	<i>Rorippa sylvestris</i>
Japanese rose (basic strain)*	<i>Rosa rugosa</i>
Red elderberry	<i>Sambucus racemosa</i>
Canada goldenrod	<i>Solidago canadensis</i>
Tall goldenrod	<i>Solidago altissima</i>
Giant goldenrod	<i>Solidago gigantea</i>

CNIDARIA

Caspian polyp or freshwater hydroid	<i>Cordylophora caspia</i>
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NEMATODES

Sugarbeet nematode	<i>Heterodera schachtii</i>
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RINGED WORMS (ANNELIDA)

Red gilled mud worm (3 species)	<i>Marenzelleria</i> spp.
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MOLLUSCS

Spanish slug*	<i>Arion lusitanicus</i>
Orange-banded arion	<i>Arion fasciatus</i>
Dark false mussel	<i>Mytilopsis leucophaeata</i>
Banded slug or three-band garden slug	<i>Lehmannia valentiana</i>

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CRUSTACEANS (ARTHROPODA)

Signal crayfish	<i>Pacifastacus leniusculus</i>
Bay barnacle	<i>Balanus improvisus</i>
Fishhook waterflea	<i>Cercopagis pengoi</i>

INSECTS AND ARACHNIDS (ARTHROPODA)

Greenhouse whitefly	<i>Trialeurodes vaporariorum</i>
Potato aphid	<i>Macrosiphum euphorbiae</i>
Greenhouse thrips	<i>Heliethrips haemorrhoidalis</i>
Broad mite	<i>Polyphagotarsonemus latus</i>
Pharaoh ant	<i>Monomorium pharaonis</i>
Indian meal moth	<i>Plodia interpunctella</i>
Mediterranean flour moth	<i>Ephestia kuehniella</i>
Western flower thrips	<i>Frankliniella occidentalis</i>
Crescent-marked lily aphid	<i>Aulacorthum circumflexum</i>
European pepper moth	<i>Duponchelia fovealis</i>
Long-tailed mealybug	<i>Pseudococcus longispinus</i>
[hawthorn psyllid]	<i>Cacopsylla melanoneura</i>
Oleander scale	<i>Aspidiotus nerii</i> (syn. <i>hederae</i>)
Chrysanthemum aphid	<i>Macrosiphoniella sanborni</i>
Glasshouse potato aphid	<i>Aulacorthum solani</i>
Cotton aphid	<i>Aphis gossypii</i>
Scarlet lily beetle	<i>Lilioceris lili</i>
[predatory mirid bug]	<i>Nesidiocoris tenuis</i>
Banded greenhouse thrips	<i>Hercinothrips femoralis</i>
Brown soft scale	<i>Coccus hesperidum</i>
Odd beetle	<i>Thylodrias contractus</i>
Hemispherical scale	<i>Saissetia coffeae</i>

Green peach aphid	<i>Myzus persicae</i>
Pear leaf-curling midge	<i>Dasineura pyri</i>
Dermestid beetle	<i>Reesa vespulae</i>
Sawtoothed grain beetle	<i>Oryzaephilus surinamensis</i>
Destructive flour beetle	<i>Tribolium destructor</i>
Emerald ash borer	<i>Agrilus planipennis</i>
Fern scale	<i>Pinnaspis aspidistrae</i>
Shallot aphid	<i>Myzus ascalonicus</i>
Palm thrips	<i>Parthenothrips dracaenae</i>
Black vine weevil	<i>Otiorhynchus sulcatus</i>
Clothing moth	<i>Tineola bisselliella</i>
Citrus mealybug	<i>Planococcus citri</i>
Fur beetle	<i>Attagenus woodroffei</i>
FISH (PISCES)	
Brook trout	<i>Salvelinus fontinalis</i>
MAMMALS (MAMMALIA)	
North American beaver	<i>Castor canadensis</i>
Domestic cat (only when feral)	<i>Felis silvestris catus</i>
[American] mink*	<i>Mustela vison</i>
Brown rat	<i>Rattus norvegicus</i>
Raccoon dog	<i>Nyctereutes procyonoides</i>
European rabbit	<i>Oryctolagus cuniculus</i>

Bay barnacle (*Balanus improvisus*)

PHOTO: TERHI RYTTÄRI

LIST OF POTENTIALLY OR LOCALLY HARMFUL ALIEN SPECIES IN FINLAND

Table 6: Potentially or locally harmful alien species in Finland.

Potentially or locally harmful alien species in Finland (123)	
* = not found in Finland yet	
VIRUSES AND VIROIDS	
Apple mosaic virus (ApMV)	<i>Apple mosaic virus</i> (ApMV)
Tobacco rattle virus (TRV)	<i>Tobacco rattle virus</i> (TRV)
PHYTOPLANKTON	
[dinoflagellate species]	<i>Prorocentrum minimum</i>
FUNGI	
Dutch elm disease*	<i>Ophiostoma ulmi</i> , <i>Ophiostoma novo-ulmi</i>
Cephalosporium stripe	<i>Hymenula cerealis</i>
Leaf spot	<i>Alternaria alternata</i>
Fruit rot*	<i>Fusicoccum putrefaciens</i>
Brown spot needle blight of pine*	<i>Mycosphaerella dearnessii</i>
Covered smut of barley	<i>Ustilago hordei</i>
Pitch canker*	<i>Gibberella circinata</i>
Septoria tritici blotch	<i>Mycosphaerella graminicola</i>
VASCULAR PLANTS (TRACHEOBIONTA)	
Balsam fir	<i>Abies balsamea</i>
Siberian fir	<i>Abies sibirica</i>
Sycamore maple	<i>Acer pseudoplatanus</i>
Black-grass	<i>Alopecurus myosuroides</i>
Red-root amaranth	<i>Amaranthus retroflexus</i>
Common ragweed	<i>Ambrosia artemisiifolia</i>
Scarlet pimpernel	<i>Anagallis arvensis</i>
Barren brome	<i>Bromus sterilis</i>
Soft hornwort	<i>Ceratophyllum submersum</i>
Canadian horseweed	<i>Conyza canadensis</i>
White dogwood	<i>Cornus alba</i> ssp. <i>alba</i>
Red-osier dogwood	<i>Cornus alba</i> ssp. <i>stolonifera</i>
Cockspur grass	<i>Echinochloa crus-galli</i>
Canadian waterweed (in the Baltic Sea)	<i>Elodea canadensis</i>
Western waterweed*	<i>Elodea nuttallii</i>
Fodder galega	<i>Galega orientalis</i>
Downy ryegrass	<i>Leymus innovatus</i>
Nootka lupine	<i>Lupinus nootkatensis</i>
Yellow skunk cabbage	<i>Lysichiton americanus</i>
Cultivated apple	<i>Malus domestica</i>
Fringed water lily, or yellow floating heart*	<i>Nymphoides peltata</i>
Red poppy	<i>Papaver rhoeas</i>
Giant butterbur	<i>Petasites japonicus</i> ssp. <i>giganteus</i>
Broad-leaved meadow grass	<i>Poa chaixii</i>
Pin cherry	<i>Prunus pensylvanica</i>
Western red cedar	<i>Thuja plicata</i>
Aleutian ragwort	<i>Senecio cannabifolius</i>
Yellow foxtail	<i>Setaria pumila</i>
Green foxtail	<i>Setaria viridis</i>

False spiraea	<i>Sorbaria sorbifolia</i>
Comfrey	<i>Symphytum</i> var. <i>officinale</i> and var. <i>bohemicum</i>
Russian comfrey	<i>Symphytum</i> × <i>uplandicum</i>
COMB JELLIES (CTENOPHORA)	
Warty comb jelly*	<i>Mnemiopsis leidyi</i>
NEMATODES	
Eel swim bladder nematode	<i>Anguillicola crassus</i>
MOLLUSCS	
Quagga mussel*	<i>Dreissena bugensis</i>
Asian clam*	<i>Corbicula fluminea</i>
Zebra mussel	<i>Dreissena polymorpha</i>
CRUSTACEANS	
Spinycheek crayfish*	<i>Orconectes limosus</i>
Danube crayfish	<i>Astacus leptodactylus</i>
Harris mud crab	<i>Rhithropanopeus harrisii</i>
Marbled crayfish*	<i>Procambarus</i> sp.
[amphipod]*	<i>Gmelinoides fasciatus</i>
Tiger sideswimmer	<i>Gammarus tigrinus</i>
Chinese mitten crab	<i>Eriocheir sinensis</i>
Killer shrimp*	<i>Dikerogammarus villosus</i>
[amphipod]*	<i>Pontogammarus robustoides</i>
INSECTS AND ARACHNIDS (ARTHROPODA)	
Red-legged ham beetle	<i>Necrobia rufipes</i>
Poinsettia thrips	<i>Echinothrips americanus</i>
American cockroach	<i>Periplaneta americana</i>
Australian cockroach	<i>Periplaneta australasiae</i>
Multicoloured Asian lady beetle*	<i>Harmonia axyridis</i>
Leafhopper	<i>Iguttix oculatus</i>
Confused flour beetle	<i>Tribolium confusum</i>
Cotton bollworm*	<i>Helicoverpa armigera</i>
Auger beetles	Bostrichidae
Khapra beetle*	<i>Trogoderma granarium</i>
Ligurian leafhopper*	<i>Eupteryx decemnotata</i>
Aphid*	<i>Illinoia azaleae</i>
Horse-chestnut leaf miner	<i>Cameraria ohridella</i>
Merchant grain beetle	<i>Oryzaephilus mercator</i>
Yellow rose aphid*	<i>Rhodobium porosum</i>
[hawthorn psyllid]	<i>Psylla buxi</i>
Fringed orchid aphid*	<i>Cerataphis orchidearum</i>
Tulip bulb aphid*	<i>Dysaphis tulipae</i>
Greedy scale*	<i>Hemiberlesia rapax</i>
Purple scale*	<i>Lepidosaphes beckii</i>
Fig scale*	<i>Lepidosaphes conchiformis</i>
Hellebore aphid*	<i>Macrosiphum hellebori</i>
Mangold aphid*	<i>Rhopalosiphoninus staphyleae</i>
Apple grass aphid*	<i>Rhopalosiphum insertum</i>
Rice root aphid*	<i>Rhopalosiphum rufiabdominale</i>
Buff-tailed bumblebee	<i>Bombus terrestris</i>
House cricket	<i>Acheta domesticus</i>
Greenfly*	<i>Coloradoa rufomaculata</i>

Bread beetle	<i>Stegobium paniceum</i>
Rusty grain beetle	<i>Cryptolestes ferrugineus</i>
Red scale*	<i>Aonidiella aurantii</i>
[mirid bug]*	<i>Dichroscytus gustavi</i>
Corn leaf aphid*	<i>Rhopalosiphum maidis</i>
Strawberry aphid*	<i>Chaetosiphon fragaefolii</i>
Bark beetles	<i>Scolytus</i> spp.
South American tomato moth*	<i>Tuta absoluta</i>
Black olive scale*	<i>Saissetia oleae</i>
Violet aphid*	<i>Myzus ornatus</i>
Bean weevil	<i>Acanthoscelides obtectus</i>
Powder post beetle	<i>Lyctus africanus</i>
Long-horned beetle	<i>Stromatium unicolor</i>
Douglas-fir seed chalcid*	<i>Megastigmus spermotrophus</i>
Red spider mite*	<i>Tetranychus evansi</i>
Brown-banded cockroach	<i>Supella longipalpa</i>
Anthurium thrips*	<i>Chaetanaphothrips orchidii</i>
Lily thrips*	<i>Liothrips vaneeckei</i>
Begonia thrips*	<i>Scirtothrips longipennis</i>
Common cockroach	<i>Periplaneta orientalis</i>
Brown carpet beetle	<i>Attagenus smirnovi</i>
Varied carpet beetle	<i>Anthrenus verbasci</i>
Siberian conifer silk moth*	<i>Dendrolimus</i> spp.
Tomato russet mite	<i>Aculops lycopersici</i>
Firebrat	<i>Lepismodes inquilinus</i>
FISH (PISCES)	
Lake trout	<i>Salvelinus namaycush</i>
Prussian carp	<i>Carassius aurelius gibelio</i>
Common carp	<i>Cyprinus carpio</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
Humpback salmon	<i>Oncorhynchus gorbuscha</i>
Round goby	<i>Neogobius melanostomus</i>
Peled, or northern whitefish	<i>Coregonus peled</i>
Chinese sleeper*	<i>Percottus glehni</i>
Tubenose goby	<i>Proterorhinus marmoratus</i>
BIRDS (AVES)	
Canada goose	<i>Branta canadensis</i>
Ruddy duck*	<i>Oxyura jamaicensis</i>
MAMMALS (MAMMALIA)	
Muskrat	<i>Ondatra zibethicus</i>
White-tailed deer	<i>Odocoileus virginianu</i>

PARTICULARLY HARMFUL ALIEN SPECIES

Some invasive alien species have been deemed so harmful that they require immediate and effective action. Measures specifically named in legislation may be required for combating these alien species.

Particularly harmful alien species should principally be identified through risk assessment. The experts who prepared the present Strategy identified five particularly harmful species. Immediate and enhanced effective action must be taken regarding these species (targeted measures nos. 1, 13.4, 14.1, 14.2, 15.5 and 16 specified herein) to prevent their spread and to combat damage caused by them.

Dangerous plant pests, known as 'quarantine species', were added to the list of particularly harmful alien species (Table 7). The quarantine species are all invasive alien species and constitute the majority (37) of the list of particularly harmful alien species. Existing legislation is already being applied to quarantine species, and they are being combated using pre-agreed accurately targeted anticipatory measures and eradication measures.⁷ A complete list of quarantine species as defined in the EU may be found in the relevant Decree of the Ministry of Agriculture and Forestry (17/2008).

According to expert assessments, Finland's particularly harmful alien species – in addition to dangerous plant pests – are:

Japanese rose (*Rosa rugosa*)

Forms extensive, dense growths that threaten indigenous flora on sandy beaches in particular, together with the insect species dependent on that flora, and also the natural structure of dune forests.

Crayfish plague, type As and type Ps1

(*Aphanomyces astaci* (As, Ps1))

A threat to the survival of populations of noble crayfish in Finland.

Hogweeds (*Heracleum persicum*, *H. mantegazzianum*, *H. sosnowskyi*)

Rapidly spreading plants that pose a health hazard, causing burn-like and slowly healing skin symptoms in humans on contact. Hogweed thickets prevent any other plants from growing.

Spanish slug (*Arion lusitanicus*)

A rapidly spreading major plant pest among crops and horticulture, causing significant economic damage.

[American] mink (*Mustela vison*)

A small predator that competes with indigenous species and may have contributed to the extinction of the European mink in Finland. Also depletes populations of waterfowl and frogs, particularly in the outer archipelago.

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Japanese rose (*Rosa rugosa*)

PHOTO: TERHI RYTTÄRI

7. Plant Health Protection Act (702/2003).

Particularly harmful alien species, a water mould devastating to the indigenous noble crayfish and damaging to the signal crayfish:

Crayfish plague

Crayfish plague, caused by a water mould (*Aphanomyces astaci*) is a parasitic disease originating in crayfish in North America; it has proved devastating to freshwater crayfish. The disease has spread all over the world with American crayfish species but also migrates internationally carried by indigenous crayfish species, as in the trade of noble crayfish from Russia to Finland and on to Sweden. Several strains of crayfish plague are known. Two are found in Finland: the old strain affecting noble crayfish, which arrived in 1893 (As), and the newer strain which arrived with signal crayfish in 1967 (Ps1).

Crayfish plague can completely or nearly completely obliterate the indigenous noble crayfish (*Astacus astacus*) population of an entire lake or river. The disease rarely causes high mortality among signal crayfish (*Pacifastacus leniusculus*), a species of American origin, but it does reduce the yield and the value of the catch. In Finland, crayfish plague reduces the annual crayfish catch by an estimated 10 million individuals per year, and to compensate for this signal crayfish have been translocated first to Sweden, then to Finland and later to most European countries.



Signal crayfish and crayfish plague

The water mould that causes crayfish plague spreads through fungal spores from host to host. Sexual reproduction has not been identified, and the disease appears to have no other hosts than freshwater crayfish. The As strain of crayfish plague may remain dormant in an infected population of noble crayfish, preventing the permanent recovery of that population. Signal crayfish populations generally carry the Ps1 strain of crayfish plague and thus almost always prevent the return of noble crayfish to waters which they inhabit. The current understanding is that it is impossible to eradicate crayfish plague unless the entire crayfish population in a particular water system dies out or is otherwise destroyed.

PHOTO: JORMA KIRJAVAINEN

Dangerous plant pest (quarantine species), particularly harmful alien species threatening forests:

Pine wood nematode

Originating in North America, the pine wood nematode (*Bursaphelenchus xylophilus*) first caused widespread damage to pine forests in Japan, having migrated there with timber in the early 20th century. The species subsequently spread to China and Korea. The species may migrate with timber and packaging material made of wood, but it is unable to travel from tree to tree without an insect vector. The pine wood nematode is carried by bark beetles of the genus *Monochamus* (pine sawyers); there are three species of this genus in Finland. Of these, the black pine sawyer (*M. galloprovincialis*) has been confirmed as an insect vector in Portugal, where the pine wood nematode migrated with packaging material from China and was first sighted in 1999.

Because the pine wood nematode has caused widespread deaths of pine trees in Portugal and attempts to curb its spread have been unsuccessful, precautionary measures have been taken else-



where in Europe. Finland has a contingency plan in place in case the pine wood nematode enters the country, and the European and Mediterranean Plant Protection Organisation (EPPO) is updating its guidelines for pine wood nematode control. It is extremely difficult and expensive to eradicate the pine wood nematode from a forest once it has established itself, so anticipatory preventive measures are the cheapest way of preventing damage.

PHOTO: TIINA LAUSJÄRVI

Table 7. Dangerous plant pests, known as 'quarantine species'.

Dangerous plant pests, known as 'quarantine species' (37)	
INSECTS	
Cotton whitefly	<i>Bemisia tabaci</i>
American serpentine leafminer	<i>Liriomyza trifolii</i>
Colorado beetle	<i>Leptinotarsa decemlineata</i>
Pea leaf miner	<i>Liriomyza huidobrensis</i>
African cotton leafworm	<i>Spodoptera littoralis</i>
Melon thrips	<i>Thrips palmi</i>
BAKTERIA	
Bacterial angular leaf spot of strawberry	<i>Xanthomonas fragariae</i>
Apple proliferation disease	<i>Candidatus phytoplasma</i>
Potato ring rot (dark)	<i>Ralstonia solanacearum</i>
Potato ring rot (light)	<i>Clavibacter michiganensis</i> ssp. <i>sepedonicus</i>
Fire blight	<i>Erwinia amylovora</i>
FUNGI	
Western gall rust	<i>Endocronartium harknessii</i>
Oak wilt	<i>Ceratocystis fagacearum</i>
White rust	<i>Puccinia horiana</i>
Red stele	<i>Phytophthora fragariae</i> var. <i>fragariae</i>
Foliar rust	<i>Melampsora medusae</i>
Brown rot	<i>Monilinia fructicola</i>
Potato wart disease	<i>Synchytrium endobioticum</i>
Partial bunt of wheat	<i>Tilletia indica</i>
Sudden oak death	<i>Phytophthora ramorum</i>
White pine blister rust	<i>Cronartium ribicola</i>
VIRUSES AND VIROIDS	
Beet necrotic yellow vein virus (BNYVV)	<i>Beet necrotic yellow vein virus</i> (BNYVV)
Cucumber yellow stunting disorder virus (CYSVD)	<i>Cucurbit yellow stunting disorder virus</i> (CYSVD)
Cucumber vein yellowing virus (CVYV)	<i>Cucumber vein yellowing virus</i> (CVYV)
Impatiens necrotic spot virus (INSV)	<i>Impatiens necrotic spot virus</i> (INSV)
Tomato spotted wilt virus (TSWV)	<i>Tomato spotted wilt virus</i> (TSWV)
Tomato yellow leaf curl virus (TYLCV)	<i>Tomato yellow leaf curl virus</i> (TYLCV)
Tomato chlorosis virus (TCV)	<i>Tomato chlorosis virus</i> (TCV)
Potato spindle tuber viroid (viroid)	<i>Potato spindle tuber viroid</i> (viroid)
Hop stunt viroid (HSVd)	(viroid)
Chrysanthemum stunt viroid (CSVd) (viroid)	<i>Chrysanthemum stunt viroid</i> (CSVd) (viroid)
Tomato apical stunt viroid (TASVd)	(viroid)
Tomato chlorotic dwarf viroid (TCDVd)	(viroid)
NEMATODES	
Root-knot nematodes	<i>Meloidogyne</i> spp.
Pine wood nematode	<i>Bursaphelenchus xylophilus</i>
Yellow potato cyst nematode	<i>Globodera rostochiensis</i>
White potato cyst nematode	<i>Globodera pallida</i>

CHALLENGES BROUGHT BY CHANGES IN THE OPERATING ENVIRONMENT

Climate change

According to the reports of the International Panel on Climate Change, the changes in the climate will be the greatest in the northern latitudes. Finland's climate may become 2 to 4 degrees warmer by the middle of the century. Climate change is anticipated substantially to increase the number of alien species in Finland and the damage they cause. Under new climate conditions, the survival probabilities of many alien species will improve to a point where they can colonise a new region. For instance, a warmer climate may enhance the breeding potential of a species and reduce natural mortality. As the climate becomes warmer, populations of already established alien species may spread further north. Moreover, the impacts of alien species on the natural environment of the destination country may change.

Aggressively spreading invasive alien species benefit more from climate change than the indigenous species. Successful alien species share characteristics such as wide tolerance for conditions in the physical environment, a broad distribution range, good spreading potential, rapid growth and a 'weed-like' growing pattern in their original range.

Climate change is also affecting the relationships between plants and plant diseases. However, the greatest potential threat from climate change is the arrival of numerous new and unpredictable diseases, or insects that are disease carriers. Alien species currently only surviving in greenhouses may begin forming populations outside greenhouses that can survive the winter.

According to global macroclimate analyses⁸, anticipatory combating of invasive alien species is of crucial importance. Analyses show that similarity of climate between the original range and the new distribution range is just about the only feature that commonly explains why alien species thrive in new areas. Alien species whose distribution

range and vitality depend primarily or only on thermal factors (thermal sum, winter cold) can find regions similar in climate in North America, Eurasia and on other continents. For instance, many of the species that have proved to be invasive alien species in North America are potentially harmful species in Europe.

Research indicates that the climate in southern Finland between 2021 and 2050 will correspond to the current climate in Estonia, Latvia, Lithuania and parts of Denmark (in terms of thermal sum and the temperature of the coldest month). Between 2051 and 2080, the climate in southern Finland is expected to correspond to the current climate in Poland, Denmark and the Netherlands, and even Belgium and central Germany in the archipelago and on the south-western coast. The impacts of climate change in Finland will include the strengthening of populations of already established alien species, the development of new, viable populations, the spread of species to new areas, increased harmful impacts of invasive alien species, and the entry to Finland of new alien species capable of reproducing in the wild.

There are invasive alien species in the Baltic states and Denmark which have already become established in Finland (e.g. the large-leaved lupine, Japanese rose and [American] mink), or which are currently gaining a foothold in Finland (e.g. goldenrods from North America), or which have not yet found their way into the wild in Finland or do not yet occur in Finland (e.g. the wild cucumber and multicoloured Asian lady beetle).

Several of the invasive alien species whose range is currently limited to central Europe and areas to the south of the Gulf of Finland naturally inhabit areas in North America which are very much like southern Finland in terms of climate. It is thus to be expected that these species might successfully migrate north to Finland in the near future. Some 20 of the 100 worst species in the Global Invasive Species database occur in North America or on other continents in areas similar in climate to Finland (e.g. the common carp, zebra mussel, Asian long-horned beetle and grey squirrel). Some of the worst invasive alien species listed in the DAISIE project (e.g. the tree of heaven, black locust or false acacia, black cherry, pine wood nematode and raccoon) occur in North America in areas similar in climate to Finland. Of the quarantined species of plant pest listed by the EPPO, more than 100 occur in North America in areas similar in climate to Finland. For many species like

8. Research project: Anticipating the significance of climate change in the spreading of species to Finland: Synthesis of research findings and macroclimate comparison (Risto Heikkinen, Juha Pöyry, Stefan Fronzek, Niko Leikola), 2010.

this, there are no significant climate limitations to their spreading to northern Europe and establishing themselves as alien species in Finland.

Increased international trade and internet trade, personal mobility and import of alien species

Increased international trade, transport and travel increase the responsibilities of the authorities responsible for human, animal and plant health. Over the past 15 years, the increase in international passenger numbers in Finland has been more than 100% by air, about 50% by rail and about 20% by sea. The volume of international rail goods transports has remained stable, but the volume of cargo transported by air and by sea has increased by about 50%. Online shopping has grown by nearly 200% over the past decade and continues to grow at an increasing rate.

Trade enables the intentional and unintentional spread of species and diseases. Intentional spread includes imports of alien species for production purposes, for personal use, for sources of bioenergy, for pharmaceutical purposes, for ornamental use (garden plants), for biological pest control or for companionship (pets). Online shopping has increased greatly in the past years, and it is now relatively easy to purchase live aquarium fish and items such as plants and garden plants over the Internet. However, many useful alien species can have surprising negative side effects. They may also unintentionally spread other species or diseases, either in the imported product, animal or plant itself or in the packaging used to transport it. In the USA, it is estimated that international trade is the principal entry pathway for invasive alien species. In cases between 1980 and 1992 where the pathway for alien species could be determined, 81% had entered the country unintentionally with imported goods.

Means of transport also offer an easy way for alien species to spread rapidly around the world. Aircraft are bigger and faster than before. Ships offer many different ways for species to migrate. There are plenty of hiding places in the superstructure; there may be rats in the cargo hold; containers may contain invertebrates and plant seeds; the crew and passenger rooms and food may contain micro-organisms and plants; the crew and passenger themselves may be carriers of pathogens; the ballast water may contain water animals and plants; still other species may attach to the hull or

anchor chains of the ship; and so on. Transport routes (roads and canals) also enable migration of species.

It is estimated that in 2020 there will be 1.6 billion international tourists in the world per year, more than double the present figure. Tourists are travelling increasingly widely, carrying species with them from exotic regions to foreign countries – Finland not excepted. Tourists and other travelers may carry many different kinds of organisms in their shoes, their clothes or their luggage, or on or in their own bodies (pathogens). Migration-related travel is also increasing, as people who have moved across the world travel to meet their friends and relatives. Species and diseases may also be imported for criminal purposes or with the intent of causing harm. Pet smuggling, for instance, is a risk of considerable significance. Bio-terrorism is also a possibility attracting increasing worldwide attention.

Challenges in the chemical combating of invasive alien plants and plant pests

Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market (also known as the *Plant Protection Products Regulation*) contains stricter criteria for approval of active substances of plant production products than the currently valid Directive (EEC) 414/1991. Evaluation of active substances pursuant to the current Directive has already resulted in elimination from the market so that of the c. 1,000 active substances on the market in 1993 only about 250 remain. As a result, many plant protection products that used to be in widespread use have been taken off the market, significantly narrowing the range of plant protection products available in Finland as elsewhere in the EU. It is to be expected that the range of products will become even narrower, as more active substances will be banned from the market by the Plant Protection Products Regulation. To be sure, the chemical industry is introducing new active substances, but at nowhere near the same rate.

The purpose of Directive (EC) 128/2009 of the European Parliament and of the Council establishing a framework for Community action to achieve the sustainable use of pesticides (the *Sustainable Use of Pesticides Directive*) is to reduce the risks and impacts on human health and the environment of the use of plant protection prod-

ucts. The Directive requires Member States to adopt a National Action Plan to set up objectives, measures and timetables for implementing the provisions of the Directive. Measures to be employed include training of pesticide users; testing of distribution equipment; increasing general awareness of plant protection; and rendering integrated pest management compulsory, which will increase the use of biological pest control. In Finland, the Ministry of Agriculture and Forestry has led the preparation of the National Action Plan on the sustainable use of pesticides 2010–2020. The Plant Protection Product Regulation and the Sustainable Use of Pesticides Directive, together

with the Regulation concerning statistics on pesticides and the amendment to the Machinery Directive concerning machinery for pesticide application, constitute the thematic strategy of the EU for the sustainable use of pesticides.

Changes in plant production, such as the relocation of horticultural seedling production to other countries, increase the likelihood that there are already increasing levels of plant pests resistant to pesticides present in Finland's plant production industry, imported with plant propagation materials.

FINLAND'S NATIONAL STRATEGY ON INVASIVE ALIEN SPECIES

ACTION PLAN

The Action Plan implements the Government Resolution on Finland's National Strategy on Invasive Alien Species (Part I) in line with the Strategy proposal¹, with certain revisions made based on the comments received.

The purpose of the Action Plan is the prevention and early elimination of the harmful impacts of invasive alien species, which is usually the most cost-effective approach. Prevention and early intervention are crucially important for the attainment of the goals of Finland's National Strategy on Invasive Alien Species.

GENERAL MEASURES CONCERNING ALL INVASIVE ALIEN SPECIES

Part III of the Strategy identifies actual and potential direct and indirect harmful impacts of invasive alien species in Finland. A variety of measures is required for combating the actual impacts. General measures affecting several invasive alien species or groups of same form the foundation of the National Strategy, including but not limited to:

1. Augment the legislation on invasive alien species for comprehensive coverage.
2. Appoint an expert body to monitor progress on measures concerning invasive alien species.
3. Introduce publicity and training measures concerning invasive alien species.
4. Set up an invasive alien species portal online.

1. Proposal for a National Strategy on Invasive Alien Species – Working group memorandum MMM 2011:2 (in Finnish)

5. Set up an early warning and invasive alien species monitoring system.
6. Set up a national risk assessment system for invasive alien species.
7. Increase research into invasive alien species, particularly research that supports risk assessment.
8. Establish potential for preventing the entry of invasive alien species into the country and for rapid deployment of measures against invasive alien species that have managed to enter the country.
9. Encourage citizens to undertake voluntary measures to combat invasive alien species.
10. Develop funding mechanisms for combating invasive alien species.
11. Ensure that the transborder migration of invasive alien species through Finland can be prevented.
12. Participate in international action to combat invasive alien species.

Besides the measures concerning all invasive alien species there is a need measures targeted to specific species, which will be presented further below. These include:

13. Address the harmful impacts of invasive alien species in the Baltic Sea and in inland waterways.
14. Address the harmful impacts of invasive alien land vertebrate species.
15. Address the harmful impacts of invasive alien land plant species.
16. Eradicate hogweeds from Finland.

Actors and a timetable have been assigned for each measure. The timetables for the measures are shown in Figure 1. All these measures are mutually supportive (see Figure 2).

Target timetables for implementing the measures

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2030
1. Develop legislation	Development preparation									
2. Set up an expert and monitoring body (for IAS)	Appointment preparation	Body in operation								
3. Publicity and training	Publicity plan			Training and campaigns continue						
4. Invasive alien species portal	Portal setup			Portal in use						
5.1. Early warning system		System development			System in use					
5.2. Monitoring	Intensive monitoring				Monitoring focusing on changes					
6. Risk assessment system	Organisation, model development, initial prioritisations				Risk assessment system in use					
7. Research	Setting up a research programme and preparing a plant protection research strategy					Research on impacts continues				
8. Prepare for preventing entry	Tools for import, distribution and sales restrictions and for monitoring of pathways					Systems in use				
9. Volunteer action	Encouraging of actors and support for NGOs									
10. Explore and develop funding mechanisms	Alternative sources exploration			Leveraging new funding mechanisms						
11. Ensure that no invasive alien species spread from Finland	Measures against designated species									
12. International measures	Address invasive alien species in international co-operation									
13.–15. Targeted measures	Implementation of targeted measures against invasive alien species in the Baltic Sea and inland waterways and against invasive alien land vertebrates and plants									
16. Eradicate hogweeds	Eradication project setup, resourcing, organisation and execution									Eradicated
More detailed timetables for each measure are given in the text.										

Figure 1: Target timetables for implementing the measures presented in the Action Plan.

1 AUGMENT THE LEGISLATION ON INVASIVE ALIEN SPECIES FOR COMPREHENSIVE COVERAGE

Target

The target is that legislation concerning the management of, and the limitation of risks caused by, invasive alien species is comprehensive and up to date. This development follows and takes into account the preparation work in the EU on invasive alien species and the related legislative elements. Legislative development should be based on the ‘polluter pays’ principle and the precautionary principle as defined in the Convention on Biological Diversity.

Impacts

Although there are provisions concerning alien species in several Acts, the relevant legislation as

it now stands is incomplete, fragmented and incoherent. This complicates the management of risks and harmful impacts. Legislative reform will create a legal basis for action to prevent the spread of an established invasive alien species or to combat the harmful impacts of same. Legislation is also needed to provide for measures that can be rapidly deployed to combat a newly arrived alien species suspected of being an invasive alien species.

Legislation will clarify the responsibilities of and relationships between various actors in combating invasive alien species, including financial responsibilities. This will make practical efforts more efficient while enabling further development of actions to minimise the risks of invasive alien species and to mitigate their harmful impacts.

Implementation

A legislation reform will be undertaken to make the provisions concerning invasive alien species comprehensive and up to date so that their harmful impacts can be prevented and limited. Legislation will be harmonised either by amending existing legislation or, if necessary, by enacting a special Act on invasive alien species. The following issues in particular, emerging in the preliminary work on the Strategy, shall be taken into account in the legislative reform:

Current legislation does not include a comprehensive identification of invasive alien species. For instance, there are no specific definitions in law of alien species, invasive alien species, particularly harmful alien species or significant harm caused by invasive alien species requiring particularly strong preventive measures.

Current legislation does not unambiguously define the responsibilities and duties of various authorities nor specify which parties are responsible for undertaking measures to eradicate invasive alien species.

The legislation does not include provisions for all invasive alien species to authorise immediate action to eradicate a population of a new invasive alien species as soon as the first sightings of that species in Finland are made. Also, legislation does not provide for the sufficient availability of plant protection products in the plant production product register for immediate deployment in a crisis situation.

Current legislation does not specify sufficient requirements for notification of an invasive alien species. Current legislation does not oblige landowners to eradicate an invasive alien species from their property and does not allow the eradication of an invasive alien species without permission from the landowner.

Also, current legislation makes no provision for a risk assessment and early warning system.

Current legislation does not sufficiently cover the sale, offering for sale or distribution of invasive alien species. Importers, sellers and users have no liability under law for the intentional spreading of an invasive alien species. The sale and distribution of species known to be particularly harmful (e.g. hogweeds and similar aggressively propagating

species whose harmful impacts will probably increase as the climate becomes warmer) should be restricted. There is no list of organisms (species) whose import is prohibited (or allowed). There is no control of the internet trade in alien species.

Under the current system, import licences for animals have to be processed by 3 or 4 different authorities, and the process can easily take weeks or months. The co-ordination of all import licensing matters provided for in the legislation on animal diseases, animal protection, nature conservation and hunting should be assigned to a single authority.

Under current legislation, the restriction and combating of the spread of alien species of an animal in the wild is complicated by the fact that the sustainable use principle currently applies to many invasive alien species. Obviously the principle of sustainable use must be derogated from in the case of an invasive alien species. Derogations from statutory hunting seasons and from hunting and trapping methods allowed by law should also be authorised when combating an invasive alien species.

Current legislation does not allow for the eradication of an animal that has escaped into the wild and is threatening indigenous populations. It should be explored in connection with the legislative reform how such eradications could be carried out by the authorities without reference to land ownership or hunting rights.

Current legislation does not address the issues of feral individuals of alien species, cross-breeds or escaped domestic animals. The legislative reform should include allowing the authorities to eradicate when found in the wild any feral individual of alien species, cross-breed (e.g. a dog-wolf) or feral escaped domestic animal that could breed with a wild species. The provisions regarding cats kept as pets should be improved to prevent cats from becoming feral (cf. Part III footnotes 2–6) and reducing the harmful impacts thereof.

Current legislation does not allow for the prohibiting of the import, ownership, transfer or sale as household pets or recreation of cross-bred cats and dogs whose ancestors in the previous four generations include wild individuals.

Current legislation does not take into account that seeds or parts of invasive alien species of plant may be intentionally or unintentionally left on the ground or in the soil, causing soil contamination² or even a hazard to humans or the environment. Seeds of invasive alien species of plant may be intentionally or unintentionally transferred with earth removals. Also, land infested by an invasive alien species may currently be built upon without any obligation of eradicating invasive alien species in the soil.

Current legislation does not require notification of fish and crayfish stocking. Consequently, there is no current information on how alien species are used for stocking or on how these species have spread or are thriving. Legislation should require reporting on stocking and maintenance of a database (stocking register) regionally and nationally, and also stipulate that this information shall be public and how it may be used.

Current legislation does not allow for preventing the spreading of certain alien fish and crayfish diseases and parasites to new waterways through fish and crayfish stocking. This is particularly relevant to the transport of fish and crayfish from the brackish water of the Baltic Sea to inland waterways and between separate inland waterway systems across borders to natural migration. Exploring the extent of this problem would require research and risk assessment; eradicating the problem would require more advanced methods. If necessary, the live transfers of fish and crayfish, whether for farming or for stocking, should be provided for in legislation in more detail.

There is no EU-level or national legislation governing the use of alien organisms in biological control or the import and use of alien species of insect pollinators, except for the animal health and plant health requirements on the import of bees. The need for legislation concerning organisms used in biological control must be evaluated, and if necessary legislation shall be enacted concerning the import of and internal market trade in these organisms. First, however, the availability of biological control in Finland must be investigated,

based for instance on EPPO recommendations on the impacts of biological control organisms in Europe. The import of alien insect pollinator species shall be monitored.

Under current legislation, an authority can require an operator to eradicate plant pests found in seedling stock, or can take action to eradicate them himself, or can impose a marketing ban on the seedlings infested by the plant pests. However, an authority cannot order an operator to eradicate plant pests elsewhere in the environment. Legislation should be amended so as to require businesses marketing seedlings to eradicate particularly harmful alien species such as the Spanish slug from their properties and to require local authorities and other landowners to take action to eradicate same at least in those areas on their property that are known to be used by said species for concealment and reproduction.

Subsidy systems provided for in various Acts do not contain clear terms and conditions designed to limit the spread of invasive alien species. The legislation governing subsidies and funding should be examined and improved so as to include provisions conducive to containing the spread of invasive alien species.

Current legislation does not impose sufficient sanctions. The provisions on sanctions in this area in current legislation are unclear or incomplete. Sanctions must be clearly based on negligence.

The legislative reform should take into account resourcing and the development of new funding sources (see measure no. 10). Legislation must enable the use of new, applicable sources of funding.

A proposal on the legislative reform will be prepared ex officio by officials and experts, and circulated for comment.

Actors: Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Transport and Communications and experts.

Timetable: 2012–2015.

2. 'Soil contamination' here does not refer to the presence of toxic chemicals in the soil but rather biological infestation caused by plants.

2 APPOINT AN EXPERT BODY TO MONITOR PROGRESS ON MEASURES CONCERNING INVASIVE ALIEN SPECIES

Target

The target is to create an expert body tasked with handling issues related to invasive alien species and to manage the monitoring and progress of measures addressing same.

Impacts

The expert body to be appointed will be a co-operative body streamlining the handling of issues related to invasive alien species and addressing the formulating of consistent policy for instance in EU-level negotiations. The body will support development of action to cope with invasive alien species. The body will incur certain administrative costs but may turn out to conserve resources as well in creating a more organised and stable network for dealing with issues related to invasive alien species.

Implementation

The body will be attached to the Ministry of Agriculture and Forestry. The Government will appoint the Invasive Alien Species Body on submission by the Ministry of Agriculture and Forestry for a period of five years at a time. The Body will have a chairman, a deputy chairman, regular members and deputy members. These members shall include representatives at least of the Ministry of Agriculture and Forestry, the Ministry of the Environment, the Ministry of Transport and Communications, the Finnish Environment Institute, the Finnish Game Centre, the Finnish Food Safety Authority Evira, research institutions (Finnish Game and Fisheries Research Institute, Finnish Forest Research Institute, MTT Agrifood Research Finland), universities, the Finnish Museum of Natural History, Metsähallitus, local and regional actors (Centres for Economic Development, Transport and the Environment, regional councils, local authorities), the horticulture sector, operators, and environmental and other NGOs. The Body must also have members with ethics expertise.

The Body may appoint sub-committees. The Body will have a general secretary assisted by expert secretaries in various fields requiring expert knowledge, for instance in risk assessment.

The Invasive Alien Species Body will have the following duties:

- to co-ordinate, harmonise and promote the implementation of the National Strategy on Invasive Alien Species and related legislation,
- to be the national focal point for the EU work on invasive alien species together with the Ministry of Agriculture and Forestry,
- to make submissions to the relevant authorities for measures to combat the risks and harmful impacts of invasive alien species,
- to deploy rapid response measures against invasive alien species as necessary, with the relevant authorities,
- to assist the relevant authorities in handling special issues related to invasive alien species, for instance when measures to be undertaken would have financial impacts on businesses,
- to commission risk assessments and to use them for drawing up a species list for instance of pets allowed to be imported, preparing from time to time lists of species of organisms whose import is subject to a permit, and to manage the monitoring of invasive alien species risk assessment,
- to maintain, update and confirm lists of invasive alien species,
- to co-operate closely with parties responsible for maintaining the national invasive alien species portal online,
- to prepare statements and reports to Finnish and international authorities,
- to develop innovative funding approaches, and
- to manage the monitoring of invasive alien species and the National Strategy:
 - monitoring of invasive alien species (including changes in distribution range and harm caused),
 - monitoring of implementation of the National Strategy,
 - monitoring of the effectiveness of combating measures, and
 - identifying needs for research.

Actors: Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Transport and Communications.

Timetable: Preparations to appoint the Body are launched in 2012.

3 INTRODUCE PUBLICITY AND TRAINING MEASURES CONCERNING INVASIVE ALIEN SPECIES

Target

The target is to employ publicity, training and guidelines to raise awareness of invasive alien species among key actors. This will increase their awareness and knowledge of the harm caused by invasive alien species and improve their skills and their motivation to take action against them.

Impacts

Publicity and training will be used to major effect in the implementation of the National Strategy on Invasive Alien Species and its Action Plan. Increasing publicity and training on invasive alien species will raise awareness of the related risks, which will contribute to the prevention of harmful impacts, support the implementation of restrictions and increase understanding of the necessity of robust action. Maintaining the impact of measures taken requires continuous publicity and training under changing circumstances. For instance, publicity and training must highlight information on the new invasive alien species that may spread to Finland because of climate change and globalisation (e.g. increased travel), the harmful impacts of those species and the increased risks of invasive alien species already established in Finland.

The measures require targeted resources, although some of the costs can be absorbed in other publicity and training. NGOs and advisory organisations may also be employed in publicity and training activities. Costs will be incurred by authorities, research institutions and private actors. The cost liabilities will be allocated in the revised legislation, which would also provide for responsibilities for publicity and other duties. The costs of these measures will be negligible compared with the reduction in risks that can be achieved.

This measure may contribute to increased general environmental awareness as a by-product. Its negative impacts may include the targeting of voluntary action at harmless species resembling invasive alien species.

Implementation

3.1 Draw up a publicity plan

A publicity plan concerning invasive alien species will be drawn up to support the implementation of the National Strategy.

Actors: Ministry of Agriculture and Forestry and Ministry of the Environment (responsibility for drafting) together with various actors.

Timetable: 2012.

3.1.1 Draw up guides on invasive alien species for various actors

A basic guide on invasive alien species will be written. This guide will contain instructions on how to identify invasive alien species, with pictures, and details on measures to combat them. The guide will be intended both for professionals and for ordinary citizens. The basic material will also be published online, and the guide will later be linked to the invasive alien species portal online.

Based on the basic guide, a guide on how to recognise the most harmful alien species will be prepared for professionals such as Customs officials, the expertise of Customs personnel in identifying invasive alien species will be improved to simplify border checks and to prevent the entry of invasive alien species to Finland.

Various actors will prepare other special guides aimed at specific user groups, based on the basic guide (e.g. horticulturalists, road building contractors).

Actors: Ministry of Agriculture and Forestry, Ministry of the Environment, Finnish Environment Institute (responsibility for drafting the basic guide) together with various actors. Various actors will draft the special guides.

Timetable: 2012–2013.

3.1.2 Launch and run targeted campaigns

Targeted campaigns and other publicity for the general public will be organised concerning invasive alien species, their harmful impacts and measures to combat them. National theme days will be held on current issues related to invasive alien species, and information will be provided at forestry, hunting and fishing, horticulture and pet fairs.

Publicity concerning pets and good practices in keeping pets will be organised (veterinarians, citizens). Pets bought online and imported will be given special focus.

Instructions and bulletins will be used to guide choices of garden plants, aquarium animals and plants, and other organisms closely connected with human activities from problematic alien species towards less harmful species whose impact will probably not increase even with climate change.

Actors: Ministry of Agriculture and Forestry, Ministry of the Environment (campaign co-ordination); Finnish Environment Institute, national road administration, NGOs, Finnish Museum of Natural History (museums also in Turku, Oulu, Eastern Finland, Jyväskylä), public gardens, Centres for Economic Development, Transport and the Environment (communications to the general public, organising targeted campaigns); Finnish Museum of Natural History (museums also in Turku, Oulu, Eastern Finland, Jyväskylä), animal welfare organisations and zoos (Korkeasaari) (information campaigns related to pets and the internet pet trade); Finnish Food Safety Authority Evira (information campaigns related to pets and the internet pet trade).

Timetable: 2012– (ongoing).

3.1.3 Draft a publicity strategy for plant production professionals

A national publicity co-ordination group for plant pests and weeds will be set up to prepare a plant protection publicity strategy aiming at plant pest and weed control; its implementation will be monitored and the effectiveness of the publicity evaluated by the Advisory Board for Plant Protection.

Actors: Ministry of Agriculture and Forestry, Finnish Food Safety Authority Evira (responsibility for drafting) together with various actors.

Timetable: 2012–2013.

3.1.4 Draw up a list of names in Finnish and Swedish for alien species in Finland

Official names in Finnish and Swedish will be devised for those alien species that do not yet have one.

Actors: Finnish Museum of Natural History together with the Invasive Alien Species Body, Finn-

ish Museum of Natural History (museums also in Turku, Oulu, Eastern Finland, Jyväskylä) and the terminology committee of the Finnish Entomological Society (operations responsibility), nomenclature commissions of the Biological Society of Finland Vanamo, names sub-committee of the Plant Protection Society.

Timetable: 2012–2014. The updating of names is an ongoing process.

3.2 Develop training concerning invasive alien species

Specific training concerning invasive alien species will be developed, and invasive alien species will be included as a theme in other types of training.

3.2.1 General education

Invasive alien species will be included in the national core curriculum for biology and sustainable development studies in comprehensive school and upper secondary school.

Teaching materials concerning invasive alien species will be prepared for schools.

Actors: National Board of Education (responsibility for co-ordination and preparation).

Timetable: 2012– (ongoing).

3.2.2 Vocational education

The invasive alien species theme will be added to the qualification requirements for relevant qualifications (e.g. the Vocational Qualifications in Natural and Environmental Protection, Agriculture, and Horticulture; and the related further vocational qualifications and specialist qualifications) and to the natural resources curriculum (agriculture, forestry, horticulture, fisheries, etc.). Training will also be provided for current actors and authorities (Customs, bodies requiring risk assessment).

Teaching materials concerning invasive alien species will be prepared for schools and vocational education institutions.

Actors: National Board of Education (responsibility for steering and drafting).

Timetable: 2012– (ongoing).

4 SET UP AN INVASIVE ALIEN SPECIES PORTAL ONLINE

There are already information-gathering systems in place at many organisations and institutions (e.g. the Finnish Environment Institute, the Finnish Game and Fisheries Research Institute and the Finnish Natural History Museum) for notifications by citizens, authorities, etc. concerning sightings of species and natural phenomena, collected for their own purposes and for the purposes of their respective sectors. However, these systems neither emphasise alien species nor differentiate sightings of alien species from findings of indigenous species, and as such these systems are inadequate for the immediate needs of the monitoring of invasive alien species.

Target

The target is that the relevant and up-to-date information needed in Finland for publicity, risk assessment, monitoring and combating measures related to invasive alien species will be available at one location. Another target is to create a system where information on invasive alien species can easily be received and distributed. Information will also be available on the location and extent of species populations and of combating measures taken nationwide, so that combating measures can be implemented in the right place at the right time.

The portal will serve several of the measures outlined in Finland's National Strategy and their implementation. The portal will be a notification and reporting tool that shall be linked to special websites maintained by other organisations so that all observations by people and bodies representing different interests and areas of activity can be gathered together in as user-friendly a manner as possible.

Impacts

Because of a lack of up-to-date information and the disparate nature of the information that is available, invasive alien species and their harmful impacts are not generally well known, and monitoring and combating measures addressing them are sporadic and ineffective. For many invasive alien species no action is taken against them at all.

The invasive alien species portal will substantially help the attainment of the targets of Finland's

National Strategy and the implementation of the Action Plan while also contributing to Finland's fulfilment of international obligations as follows:

- 1) The portal will help in the prevention of invasive alien species and will assist the authorities in planning and executing combating measures. The portal will support local efforts by providing a practical tool for publicity, discovering population locations and issuing instructions for combating measures.
- 2) The portal will help monitor invasive alien species, and the sighting data collected there will help study their spread and proliferation. The portal will help detect the migration of invasive alien species to new areas and to take measures against them while it is still possible. The portal will also help in evaluating the impact of combating measures undertaken.
- 3) The portal will support publicity, training and education aimed at the general public. Collecting information on invasive alien species in a one-stop shop will benefit authorities, researchers, nature conservation organisations, teachers and ordinary interested citizens.
- 4) The portal will help in risk assessment and in the development of an early warning system.

The portal is expected to be highly effective: citizens will have a single source for information and notifications; regional authorities will have a straightforward reporting channel; scientists will have reliable and up-to-date information on projects involving invasive alien species; and those popularising scientific findings and the media will have a useful, error-free and up-to-date consistent information source for national and international reporting, situation reports and legislation preparation.

Implementation

4.1 Set up an invasive alien species portal online

An invasive alien species portal will be set up for the use of authorities, experts, citizens and other actors. The portal will serve as a channel for reporting sightings and as an online guide for identifying the most harmful alien species.

Setting up the portal and keeping it up to date require targeted resources. It is possible to apply for project funding for this development, but it must

also be ensured that continuous funding will be available for maintaining and updating the portal.

The portal will contain lists of invasive alien species and potentially or locally harmful alien species, an informative description of each, aids for species determination, combating measures, photos, up-to-date distribution range maps and contact information for the responsible authorities. Sightings of invasive alien species can be submitted through the portal, using a simple map interface. The data in the portal must be based on genuine scientific research, it must be possible to update the data, and the portal must allow for a variety of search functions.

The portal will form part of the online communications concerning invasive alien species and as such will be closely connected with invasive alien species communications and the related publicity plan.

Appendix II describes how the invasive alien species alert function operates through the invasive alien species portal, together with recommendations on the information content and functions of the portal.

Actors: Ministry of the Environment, Ministry of Agriculture and Forestry and Finnish Environment Institute (setting up the portal) together with the Invasive Alien Species Body; Finnish Environment Institute, Finnish Museum of Natural History (museums also in Turku, Oulu, Eastern Finland, Jyväskylä) together with research institutions (updating).

Timetable: 2012–2014. The updating is an ongoing process.

5 SET UP AN EARLY WARNING AND INVASIVE ALIEN SPECIES MONITORING SYSTEM

Target

The target is to set up Finland's national early warning system for invasive alien species. The national early warning system will provide information as up to date as possible on the invasive alien species situation in Finland and will allow the detection of the entry of new alien species at an early stage. The system will include an alert function designed to detect the entry of new invasive alien species as early as possible.

The goal is to improve monitoring and thereby to improve methods for sighting invasive alien species, determine which regions require focus in monitoring, and to explore the impacts both of invasive alien species and of measures taken against them.

Impacts

A well-functioning early warning system will notify the authorities of the occurrence of an invasive alien species very quickly. The early warning system will enable anticipatory prevention measures to be taken and, if necessary, rapid response measures to be deployed to prevent or contain any damage. Monitoring and other collecting of information will increase our understanding of the actual risks or threats caused by invasive alien species. At the same time, we will be better able to prevent or combat harmful impacts with appropriate and timely measures. Monitoring will also generate information for evaluating the effectiveness of measures and, as necessary, for reorienting them.

The costs of the monitoring will be determined by how the early warning system is set up and how comprehensive it is. Costs may be limited by adding monitoring of invasive alien species as a function to other monitoring systems, by focusing monitoring on what risk assessment shows to be the most likely pathways for invasive alien species, and making use of volunteers in monitoring. The proposed invasive alien species portal may help carry out the monitoring in a cost-effective way. However, setting up and maintaining the system will require continuous resourcing.

Anticipatory prevention measures can stop invasive alien species from spreading before they have a chance to establish viable populations over a large area. Prevention requires preparedness and the capacity to allocate resources where and when required. Preparedness naturally ties down resources, but costs can be kept at a moderate level if this can be integrated with other monitoring functions.

Implementation

5.1 Create a national invasive alien species early warning and prevention system for Finland and strengthen the potential for anticipatory prevention

A national invasive alien species early warning and prevention system for Finland will be created, modelled on systems being designed or already in use elsewhere in the EU. The early warning system must contain a variety of components, including surveillance and monitoring functions, identification of arriving alien species, risk assessment, communications between the relevant authorities, selection of measures deployed (based on the contingency plan), and procedures and resources for rapid eradication measures.

Actors: Ministry of the Environment, Finnish Environment Institute (co-ordination) together with the Invasive Alien Species Body; Finnish Environment Institute (setting up the system as part of the invasive alien species portal) together with national actors such as the Finnish Museum of Natural History (museums also in Turku, Oulu, Eastern Finland, Jyväskylä) together with the Finnish Forest Research Institute, Finnish Forestry Center, forest management associations, and with international bodies.

Timetable: 2013–2015.

5.2 Develop the current species monitoring system to incorporate invasive alien species detection

General detection, monitoring and reporting instructions concerning alien species will be prepared, introduced and distributed to various actors. Plans will be prepared and executed for the detection of invasive alien species and for the monitoring of their occurrences. Areas not covered by systematic monitoring will be identified, and the potential for improving alien species detection and reporting will be explored. For instance, alien species detection and reporting could be added to the obligatory monitoring of surface waters under law. Shortcomings in species data will be identified.

- Monitoring efforts will focus on leveraging existing, established monitoring procedures. The monitoring method(s) best suited for monitoring of invasive alien species will be investigated.

- Monitoring will be focused on 1) species and 2) pathways. Species monitoring will involve monitoring of the number of species and their populations, population development, occurrences and the impacts of alien species. Special attention will be paid to invasive alien species and alien species already established in Finland, and how their distribution range is evolving. Species monitoring will be based on the list of invasive alien species incorporated in this Strategy. Pathway monitoring will focus on new and potentially harmful alien species that may become established in Finland and on the identification of new species, and preventing the entry of species into the country. Pathway monitoring will be based on the list of potentially or locally harmful alien species incorporated in this Strategy.
- Indicators useful for monitoring will be developed, e.g. the luonnontila.fi website in accordance with existing indicators. The use of indicator groups in the monitoring of impacts will be agreed on.
- Research will be undertaken to support monitoring, particularly in the development of monitoring the impacts of alien species.
- Co-operation in reporting will be pursued, and agreements will be made regarding the conveying sighting databases and inventory reports concerning alien species compiled by scientific societies to the relevant authorities and to the invasive alien species portal.
- An expert network will be set up to support early detection, monitoring of distribution and occurrence, and taxonomic expertise.
- The continuity of the present species monitoring work is secured. In Finland and especially at the universities there are several actors who conduct active research on systematics and taxonomy and follow the changes in the species found in Finland. Contacts must be established abroad regarding taxonomic groups for which expertise cannot be found in Finland.

Monitoring must be intensive over the first few (2–4) years, while the current state of the occurrence of alien species is being investigated. Thereafter, monitoring is meant to be focusing on changes, i.e. monitoring the alien species inven-

tory and the impacts of alien species and of prevention measures.

Actors: Invasive Alien Species Body (co-ordination), Finnish Environment Institute (species inventory monitoring, links to invasive alien species portal), Metsähallitus (nature conservation areas), Finnish Game and Fisheries Research Institute (game, fish and crayfish species, aquaculture), Finnish Food Safety Authority Evira (species inventory and occurrence monitoring), Centres for Economic Development, Transport and the Environment (species inventory monitoring, materials related to combating measures), Finnish Museum of Natural History (museums also in Turku, Oulu, Eastern Finland, Jyväskylä), Finnish Forest Research Institute, Finnish Forestry Center, forest management associations (species inventory monitoring), local authorities (occurrence monitoring) and NGOs (e.g. hunting and fishing locations).

Timetable: 2013–2015: intensive monitoring of species inventory and occurrences; 2015– (ongoing): monitoring of changes.

6 SET UP A NATIONAL RISK ASSESSMENT SYSTEM FOR INVASIVE ALIEN SPECIES

Target

The target is to improve the capacity for evaluating the risk posed by alien species and risk management measures urgently if necessary.

Impacts

Risk assessment is crucial for the control of invasive alien species. The purpose of risk assessment is to identify and describe the hazards related to the entry into the country of specific invasive alien species and to assess the probabilities of their establishment and spreading. The assessment also

involves estimating how harmful these species are and what measures are available to combat them. Risk assessment and evaluation of measures to be taken against risks help choose the risk management measures that are the best for society at large. Risk assessment supports preparedness and anticipatory planning of prevention measures. Risk assessment enables us

- to allocate existing resources to controlling the species which cause the greatest risks or which can be cost-effectively controlled,
- to allocate existing resources to cost-effective control measures (including anticipatory prevention) for each species,
- to help guide choices made by individual actors (e.g. importers), and
- to support species-specific or measure-specific contingency planning.

Risk assessment produces more information and certainty about harmful impacts; at the moment, comparative evaluation of how harmful invasive alien species are is based on evaluations made by experts. Risk assessment performed using consistent methods is conducive to the efficient use of existing resources and saves on social costs. Risk assessment also raises awareness of the problem with invasive alien species and is thus a control measure in and of itself, helping to reduce the overall risk caused by invasive alien species. Risk assessment helps focus research on particularly risky species.

If a risk assessment procedure were made compulsory, this would increase the direct costs of importing alien species, but the results of the assessments could help avoid very high costs later. In accordance with the 'polluter pays' principle³, those profiting from such imports should be liable at least in part for the costs of the risk assessment. Allocating the costs of risk assessment for unintentional import of alien species is less straightforward. The fair distribution of liabilities and responsibilities requires a general risk assessment of various functions.

3. Under the 'polluter pays' principle, anyone who damages the environment is liable for the costs incurred through preventing that damage or through correcting or compensating for it. The Environmental Liability Directive 2004/35/EC was the first piece of EU legislation to incorporate the 'polluter pays' principle as a governing legal principle. This Directive creates a common liability system designed to prevent and correct damage caused to animals, plants, habitats, water resources and soil. The environmental liability system is applied on the one hand to specifically defined professional activities and on the other hand to any professional activities where the operator has been negligent or careless. The authorities are also required to monitor that the operators liable for compensation either implement the preventive or corrective measures themselves or pay for others to do so.

Implementation

6.1 Create a consistent alien species risk assessment procedure for Finland

There is no systematic risk assessment procedure for alien species in Finland. A national procedure will be created, consisting of a three-stage risk assessment for alien species, provided for in the legislation on invasive alien species.

At the first stage of this procedure, the species to be included in the procedure will be selected on the basis of the invasive alien species portal, the early warning system and expert evaluations. At the second stage, these species will be classified according to their risks, using a prioritisation model to be developed separately. At the third stage, risk assessments will be conducted as necessary on the species assigned the highest priority. Risk assessments may also be conducted separately for individual species, groups of species, particular sectors or particular pathways.

To implement the risk assessment procedure, the risk assessment unit at the Finnish Food Safety Authority Evira will be developed by allocating an additional resource of two person-years. Also, a list of experts on points to be considered in risk assessment will be compiled for later use.

Risk assessment should, if possible, be a standardised process taking into account the relevant international guidelines in each case (e.g. the OIE and IPPC standards). Also, EU-level risk assessment recommendations will be observed for instance in connection with the EU work on invasive alien species.

Implementing the national risk assessment procedure requires:

- development of expertise related to risk assessment on invasive alien species,
- a register of experts,
- invasive alien species monitoring,
- potential for undertaking urgent risk assessments as necessary,
- a system for collecting, distributing and monitoring information on invasive alien species (portal) where data needed for risk assessment are readily available and which enables the results of risk assessments and consequent recommendations to be distributed rapidly to various user groups, and

- a classification of alien species by various criteria (e.g. ecological, economic, health, social and aesthetic impacts).

Risk analysis is a continuous process in whose development the beginning stages (organising the system, developing a prioritisation model, screening and prioritisation evaluations at the beginning, etc.) are very important. The system will require sufficient resources to work. It is important to build up methodological competence in risk management as well as species expertise for the long term so that the best expertise will always be available to risk assessment personnel for evaluating any acute hazards. Population monitoring and detection of eventual new risks are also needed.

Appendix IIIa contains a more detailed description of the risk assessment procedure.

Actors: Ministry of Agriculture and Forestry (performance guidance of MTT Agrifood Research Finland, Finnish Game and Fisheries Research Institute, Finnish Forest Research Institute, Finnish Food Safety Authority Evira) and Ministry of the Environment (performance guidance of Finnish Environment Institute); Finnish Food Safety Authority Evira (risk assessment); MTT Agrifood Research Finland, Finnish Game and Fisheries Research Institute, Finnish Forest Research Institute and Finnish Environment Institute (research needs related to risk assessment).

Timetable: 2013–2015: organising the system, developing a prioritisation model, screening and prioritisation evaluations at the beginning; 2013–(ongoing): analysis.

7 INCREASE RESEARCH INTO INVASIVE ALIEN SPECIES, PARTICULARLY RESEARCH THAT SUPPORTS RISK ASSESSMENT

Target

The target is to increase knowledge of invasive alien species and their harmful impacts.

Impacts

By improving our knowledge of invasive alien species, we will support the development of risk assessment, early detection of alien species and planning of combating measures. Knowledge of

the distribution of species is a key competence, because it is on the basis of this that legislation will be enacted and approaches determined (eradication, combating, prevention of spread, adaptation).

Resources spent on research could thus translate into significant savings down the line in invasive alien species control. Invasive alien species research may also yield new information on the spreading dynamics of species and populations and on factors affecting it. This would be of more general interest for instance in evaluating the impacts of climate change.

Implementation

7.1 Set up an invasive alien species research programme and launch an impact study

A proposal will be made to the Academy of Finland regarding an invasive alien species research programme either independently or as part of the biodiversity research programme. Invasive alien species research could be included in a variety of programmes (e.g. METSO, Life+), and project proposal rounds could be organised specifically for invasive alien species research. EU research funding has also been allocated to invasive alien species research, and Finnish scientists should take an active role in European research consortiums.

Research on the impacts of invasive alien species and the extent of those impacts will be begun for the most common invasive alien species and for those alien species which adversely affect biodiversity or which are suspected of causing indirect impacts in the natural environment that are not yet well known.

Research will be begun on the cost-effective targeting of combating measures and their effectiveness (e.g. small predators) and for instance on how to find species and variants to replace invasive alien plant species.

Actors: Invasive Alien Species Body (targeted round of research applications), Ministry of Agriculture and Forestry, Ministry of the Environment and Ministry of Transport and Communications (targeted round of research project applications), research institutions, universities, Centres for Economic Development, Transport and the Environment, Finnish Museum of Natural History (museums also in Turku, Oulu, Eastern

Finland, Jyväskylä), NGOs (responsibility for research/operations).

Timetable: 2012–2016: research programme; 2013– (ongoing): research on impacts.

7.2 Prepare a plant protection research strategy

A national plant protection research strategy will be prepared, taking into account joint research opportunities at the EU level and internationally. The plant protection research strategy will be appended to the national plant protection strategy, and its implementation will be monitored on an annual basis by the Advisory Board on Plant Protection. The following research needs emerging during the preparation of Finland's National Strategy on Invasive Alien Species will be taken into account when preparing the research strategy:

- Benefits of and implementation potential for increasing testing of symptom-free seed potatoes, and other potential for controlling potato diseases.
- Phytosanitary situation in organic cultivation and seeds, and needs for research and supervision; seed-borne diseases, weeds and plant diseases in organic production; and, particularly, invasive species threats concerning organic cultivation and through this conventional cultivation (imported seeds, 'TOS' or certified seeds, absence of plant protection substances).
- Charting of the prevalence and spread of species that are significant vectors for plant diseases (e.g. Hemiptera species, particularly aphids, scale insects and true bugs; *Trichodorus* and *Longidorus* bugs; *Monochamus* longhorn beetles).
- Development of preparedness and methods for combating new significant plant pests (including biological control), with a selection based on legislation and predictions made by MTT Agrifood Research Finland; this includes points such as keeping knowledge of combating procedures constantly up to date and engaging the authorities and research bodies in close cooperation.

Actors: Ministry of Agriculture and Forestry and Finnish Food Safety Authority Evira together with MTT Agrifood Research Finland, the Finnish Forest Research Institute, universities and other interest groups (research).

Timetable: 2012–2015.

8 ESTABLISH POTENTIAL FOR PREVENTING THE ENTRY OF INVASIVE ALIEN SPECIES INTO THE COUNTRY AND FOR RAPID DEPLOYMENT OF MEASURES AGAINST INVASIVE ALIEN SPECIES THAT HAVE MANAGED TO ENTER THE COUNTRY

Target

The target is to prepare for the combating of invasive alien species by drawing up contingency plans whereby new measures will be introduced to limit the entry into and spreading in Finland of invasive alien species. The contingency plans will also specify rapid response measures for combating invasive alien species that manage to enter the country.

Action can be taken immediately against invasive alien species to minimise their damage. Measures will be targeted appropriately with regard to both species and the action taken. Anticipatory prevention against the entry into Finland of invasive alien species and potentially harmful alien species will be undertaken, and potential for preventing the entry into Finland of potentially harmful alien species will be created.

Impacts

Species known to cause harm will be brought better under control and the spreading of their harmful impacts thus limited. Increasing monitoring and active measures along potential pathways of invasive alien species will reduce the risk of entry.

Contingency plans can help target resources to relevant species and pathways while enabling rapid response measures to be taken to combat an invasive alien species immediately after its entry into the country is detected. Risk assessment supports contingency planning.

Measures bind resources. By targeting measures appropriately, the additional cost can be considered moderate in view of the lowered invasive alien species risks and the benefits of rapid combating measures that will be achieved.

Implementation

8.1 Restrict the import, sale and distribution of intentionally imported invasive alien species

Legislation will be enacted to prohibit the sale of specific invasive alien plant species such as hog-

weeds for ornamental purposes (see measure no. 1). Import of species will be restricted and supervised by prohibiting entry and by establishing trade rules based on international invasive alien species monitoring (DAISIE, NOBAN-IS) through amendments of regulations and improved supervision of imports (import licences, customs inspections), and by improving warning markings for species on sale.

Measures will be taken, taking the precautionary principle into account, to ensure that no alien species that may have an impact for instance on biodiversity will be imported to Finland for bio-fuel production.

Measures will be developed to control online commerce to restrict unlimited imports of alien species. Efforts will be made to establish trade and import rules within the EU.

The setting up of a system to compensate businesses for any financial losses incurred for instance through investments made in the production of subsequently banned species will be explored.

Actors: Ministry of Agriculture and Forestry, Ministry of the Environment and Ministry for Foreign Affairs (legislation, EU trade and import rules), Finnish Food Safety Authority Evira (inspections and import licences), MTT Agrifood Research Finland (research), Agency for Rural Affairs (pathways for uninspected seeds, and import volumes), National Board of Customs (import licences, inspections, supervision), Ministry of Employment and the Economy (biofuels).

Timetable: 2012–2016.

8.2 Enhance measures for limiting the spread of invasive alien species with ships

The International Convention for the Control and Management of Ships' Ballast Water and Sediments will be ratified, and its provisions complied with and compliance supervised. Principal Finnish ports with international operations will be required to monitor species inventories, and the terms and conditions of their environmental permits will include a clause to this effect. This action will be taken to the international level through HELCOM, the purpose being to prevent the migration of alien species into the Baltic Sea through canals. Finland will participate in the efforts of the International Maritime Organisation (IMO) to prevent the spread of species that attach

to the hulls of ships. Voluntary instructions will be prepared first, possibly followed by internationally binding legislation at a later date. Separate instructions will be prepared for boating.

Actors: Ministry of Transport and Communications (coordination), Ministry of the Environment and Finnish Transport Safety Agency [Trafi] (ratification proceedings, instructions, regulations for shipping), Regional State Administrative Agencies (environmental permits), Centres for Economic Development, Transport and the Environment (monitoring of ports), boating and sailing associations (responsibility in own operations).

Timetable: Ratification of the Ballast Water Convention in 2012; other operations and monitoring are ongoing.

8.3 Investigate pathways and improve pathway surveillance

The pathways, volumes and plant species of uninspected seeds (online trade, bird seed, meadow seed mixes, game feeding ground seed mixes) and the need for monitoring will be investigated. Attention will be paid to the surveillance of pathways of invasive alien species in connections with goods inspections conducted by Customs. For each pathway, a responsible body will be designated for ensuring that the existence of migration routes (trade, transport, construction, etc.) does not promote the spreading of invasive alien species. See also special risk assessments (Appendix IIIa).

Regionally important migration routes and pathways for invasive alien species within the country will also be studied.

Actors: Invasive Alien Species Body (responsible for co-ordination), National Board of Customs and import authorities together with Finnish Food Safety Authority Evira (investigations).

Timetable: 2013–2016.

8.4 Strengthen anticipatory prevention

Resources will be allocated to anticipatory prevention of invasive alien species. Precautionary measures will be aimed at functions and mechanisms through which species could migrate from specific areas to Finland, examples being the horticulture trade, the transport of household animals and pets, and the wood trade. The probable approach is that contingency plans will be drawn

up for species entering the country and the most harmful species so that measures against them can be deployed rapidly if possible. Particular attention will be paid to new invasive alien species with a high probability of establishing themselves in Finland, such as:

- species which are relatively new arrivals in Europe but which have already proven to be aggressively spreading problem species and which have a broad natural range of distribution (e.g. the multicoloured Asian lady beetle),
- alien species spreading to Finland from areas which global climate comparisons indicate have a climate similar to that of Finland, there being no climate restrictions to their establishment and survival in the wild in Finland, and
- species whose risk of entry into the country or potential for causing harm is assessed as being high.

Actors: Invasive Alien Species Body (responsible for co-ordination), MTT Agrifood Research Finland (research), Finnish Environment Institute (research and invasive alien species portal), Finnish Forest Research Institute (research), Finnish Game and Fisheries Research Institute (research), Finnish Food Safety Authority Evira (risk assessments).

Timetable: 2012– (ongoing).

9 ENCOURAGE CITIZENS TO UNDERTAKE VOLUNTARY MEASURES TO COMBAT INVASIVE ALIEN SPECIES

Target

The target is to engage citizens in volunteer action to combat invasive alien species in their immediate environment. The potential of NGOs to engage large numbers of citizens in implementing Finland's National Strategy on Invasive Alien Species will be leveraged.

Impacts

Volunteer action will increase general awareness of the problems with invasive alien species, which in turn will improve early detection of same and may also restrict their spreading. NGOs are an important potential provider of information in the charting and monitoring of invasive alien spe-

cies. Local eradication campaigns undertaken by volunteers can be organised more cost-effectively and implemented more affordably through NGOs than solely through action taken by the authorities.

This action requires a well-functioning communications system ensuring information-driven volunteer operations. Such action can be made more long-term and systematic by promoting co-operation between NGOs and the authorities. This requires the authorities to invest resources in co-operating with NGOs, and the organisation of volunteer work may likewise require active input from the authorities and contacts with NGOs. The resources required for these measures must be allowed for.

Implementation

9.1 Encourage associations and farmers to apply for subsidies for the eradication of invasive alien species

National and EU funding (ERDF, EU Interreg funding, and ESF and rural development funding) will be allocated to action against invasive alien species. NGOs will be offered support and start-up subsidies for submitting EU applications for invasive alien species projects.

Associations and farmers will be encouraged to apply for agri-environmental aid for the management of heritage landscapes or for the promotion of biodiversity or landscape diversity, including the eradication of invasive alien species.

The availability of EU funds for the combating of invasive alien species will be confirmed in the national preparation for the new programme period.

Actors: Centres for Economic Development, Transport and the Environment, agricultural economic development officials in municipalities, regional councils, local authorities, and the LEADER and rural area network (counselling).

Timetable: 2012– (ongoing).

9.2 Support action against invasive alien species by NGOs

Information distribution, monitoring and investigation activities concerning invasive alien species undertaken by NGOs will be supported, as well as eradication campaigns carried out by volunteers. A website detailing national and EU fund-

ing available to NGOs will be compiled, and project funding opportunities related to invasive alien species will be developed for instance in EU single programming documents, regional development programmes and municipal environmental programmes.

NGOs will be encouraged to participate in the preparation and implementation of Finland's National Strategy on Invasive Alien Species and local treatment plans.

Actors: Ministry of Agriculture and Forestry and Ministry of the Environment (website), local authorities and regional councils (development of funding opportunities), Metsähallitus and Centres for Economic Development, Transport and the Environment (species and local management plans).

Timetable: 2012– (ongoing).

10 DEVELOP FUNDING MECHANISMS FOR COMBATING INVASIVE ALIEN SPECIES

Target

Funding models and means will be introduced which will ensure the funding required for control of invasive alien species and which will operate on the 'polluter pays' principle.

Impacts

Implementing Finland's National Strategy on Invasive Alien Species requires funding. Some measures can be implemented as separate development projects on project funding, such as the setting up of the invasive alien species portal. However, the majority of the measures proposed – monitoring, control and publicity, for instance – require continuous funding, and for the measures to be effective it is essential to secure sufficient resources.

Exploring funding mechanisms where the liability rests with parties whose actions may result in harmful impacts of invasive alien species in Finland will increase awareness of the problem among various actors. Such funding mechanisms may function as an incentive to avoid risks; this assumes, of course, that the liability for any harmful impacts that do occur is actually assigned to the relevant parties. Because it may be practically impossible to identify the liable party in any in-

dividual case, employing this principle must primarily be based on shared liability. Examples of shared liability are fees charged from all relevant actors for maintaining basic measures in this area and deposited in a fund dedicated to special combating measures.

These funding means require legislative amendments, as it is vital for their functioning that the fee obligation applies to all actors equitably. Some of the funding must be allocated to control, and any party neglecting their obligations must be subject to sanctions, which must be provided for by law. If there is no control, there is a danger of precautionary measures concerning invasive alien species not being taken, thus increasing the risk of harmful impacts.

Different funding models assign the costs to actors in different ways. Development of funding models should address the extent of actors' operations and how high their associated invasive alien species risk is.

Implementation

10.1 Strengthen existing national and EU-level funding means and sources, and develop new ones

Finland's National funding for the prevention of the threats and harmful impacts of invasive alien species will be developed.

The state budget will be revised so as to allow for action against invasive alien species: it will be ensured that the explanatory texts in the budget enable the use of state funding for the combating of invasive alien species.

Taking invasive alien species into account in the development of EU funds such as the Life+ Fund will be ensured. New funding sources will be explored, developed and introduced (see Table 8 for alternative funding sources), for instance by applying the 'polluter pays' principle.

Performance management related to invasive alien species will be improved and enhanced, and linked to funding and administrative control. The concept of examining the combined effectiveness of action against invasive alien species by various actors will be introduced.

Local government funding will be developed to allow for the impact of invasive alien species and the regional combating of same.

Actors: Invasive Alien Species Body (co-ordination, innovative funding development), Ministry of Finance, Ministry of the Environment and Ministry of Agriculture and Forestry (strategic policy outlines), Ministry of Employment and the Economy and regional councils (ERDF), Centres for Economic Development, Transport and the Environment (agriculture and fisheries funds).

Timetable: 2012–2014.

11 ENSURE THAT THE TRANSBORDER MIGRATION OF INVASIVE ALIEN SPECIES THROUGH FINLAND CAN BE PREVENTED

Target

The target is to ensure that no activities under the control of the Finnish government can cause harm in the area of another country and that Finland is not a transit country for invasive alien species and does not enable the transborder migration of invasive alien species.

Impacts

Invasive alien species may spread across national borders if preventive measures are not taken early enough. If Finland takes responsible action with regard to the spread of invasive alien species, i.e. prevents their spread to neighbouring countries, the problem can be addressed in time.

Implementation

11.1 Ensure that Finland does not allow the transborder migration or transit of invasive alien species

Finland must bear its responsibility for preventing the transborder migration of invasive alien species. Measures will be prepared and implemented to ensure that Finland does not allow transit of invasive alien species (principally the North American beaver, the raccoon dog, the white-tailed deer, the signal crayfish and the brook trout), i.e. transborder migration of such species from Finland.

Finland shall take action at the EU level to ensure that the EU is not a transit region for the spreading of invasive alien species and that such species

do not spread across internal borders within the EU.

Actors: Ministry of Agriculture and Forestry, Invasive Alien Species Body, Finnish Game Centre, regional fisheries administration.

Timetable: 2013– (ongoing).

12 PARTICIPATE IN INTERNATIONAL ACTION TO COMBAT INVASIVE ALIEN SPECIES

Target

The target is to ensure that no activities under the control of the Finnish government can cause harm from invasive alien species in the area of another country.

Impacts

Invasive alien species are a complex problem also in developing countries, but these countries have very limited means at their disposal to address the problem. Taking the invasive alien species issue into account in the planning and implementation of development co-operation projects will help prevent the entry of new alien species and combat already established ones that are causing harm. In any project in fields such as agriculture, biomass production, carbon sequestration or fishing that involves the proposed use of an alien species for any function, an appropriate risk assessment must be conducted. The Finnish authorities, co-operating with the authorities of target countries, will ensure that the principles of the Global Invasive Species Programme of the Convention on Biological Diversity are complied with in any projects funded by the Finnish government. This may include providing training for and improving the operating resources of the relevant officials in the target country. Even if a project funded by the Finnish government does not specifically involve the use of alien species, steps must be taken together with the target country that alien species are not unintentionally introduced into the target country.

Implementation

12.1 Ensure that no invasive alien species are spread through development co-operation projects or other international co-operation

Measures will be taken to ensure together with

the relevant authorities in target countries that invasive alien species are taken into account in development co-operation projects funded by the Finnish government and to prevent further spreading of the harmful impacts of invasive alien species.

The Finnish government will take responsibility in all international co-operation of ensuring that Finland does not contribute to the spreading of invasive alien species out of Finland or beyond the borders of Finland.

Actors: Ministry for Foreign Affairs (development co-operation projects), Ministry of the Environment and Ministry of Agriculture and Forestry (international co-operation projects).

Timetable: 2012– (ongoing).

TARGETED MEASURES

Part III of the Strategy identifies actual and potential direct and indirect harmful impacts of invasive alien species in Finland. In addition to general measures against all invasive alien species, targeted measures against specific species are also required for combating harmful impacts already identified. These targeted measures too are based on the internationally agreed three-tier approach: prevention and combating of invasive alien species; early detection and eradication; and prevention of spreading and implementation of continuous, long-term monitoring. Measures have also been calibrated to changes in the operating environment, including human adaptation to the harmful impacts of invasive alien species.

These targeted measures are closely related to all of the above general measures.

13 ADDRESS THE HARMFUL IMPACTS OF INVASIVE ALIEN SPECIES IN THE BALTIC SEA AND IN INLAND WATERWAYS

Target

With regard to invasive alien species in the Baltic Sea, the target is to reduce the harmful impacts and spreading of animals attaching themselves to underwater surfaces, for instance at power plants and on the hulls of vessels. Active contributions

will be made to international co-operation (FAO, IMO, IUCN, ICES, EU, HELCOM, OSPAR, the scientific community).

With regard to invasive alien species in inland waterways, the target is for local fisheries actors, i.e. fishing regions, to determine the use of and measures taken against alien species in waters under their administration in their management and treatment plans. The fisheries administration will address risk assessment of new species becoming established through its permit process, and organised fishing advice services will support the planning and implementation of same. When the threat of alien species is acknowledged at the plan level, it is possible to eradicate an invasive alien species in limited water systems and thus to prevent its becoming established.

Another target is to increase awareness among fishermen of how invasive alien species can spread with fishing gear and how invasive alien plant species, particularly waterweed, can migrate from one waterway to another with boats carried on trailers (bilge water) and with fishing nets. Fishing regions play a key role here; they should remind fishermen of this matter when issuing fishing permits.

Impacts

Measures taken against invasive alien species in the Baltic Sea can reduce their direct harmful impacts. Any side effects of such measures must be considered separately before any large-scale deployment.

Focusing attention on problems with invasive alien species in inland waterways can help prevent or slow down their spreading. At the same time, this will help gain more information on these species so that combating procedures can be accurately targeted. Increased awareness among local actors will make control of invasive alien species easier.

Implementation

13.1 Develop local measures against invasive alien species in the Baltic Sea

Local measures for removing animals attaching themselves to underwater surfaces (the dark false mussel and bay barnacle, among others) will be developed and deployed to eradicate these for instance at power plants.

Active contributions will be made to international co-operation to prevent new invasive alien species from spreading into the Baltic Sea.

Actors: Finnish Energy Industries (combating measures), Finnish Environment Institute and Finnish Transport Safety Agency (international co-operation).

Timetable: 2012– (ongoing).

There are other, more general measures concerning invasive alien species in the Baltic Sea; these are described above.

13.2 Implement special measures: brook trout

No new stocking permits will be issued, and restocking in waters where the brook trout is already established will be phased out of the management and treatment plans of fishing regions without any particular justification. The species will be eradicated in those limited (almost closed) waterways where it is possible to do so. Interaction between the brook trout, the freshwater pearl mussel and the brown trout will be investigated. Fisheries advice services must publicise the risks involved with brook trout stocking.

Actors: Ministry of Agriculture and Forestry (legislative amendments concerning stocking permits), regional fisheries authorities at Centres for Economic Development, Transport and the Environment (permits), fishing regions (management and treatment plans), fisheries advice services (publicity), Finnish Game and Fisheries Research Institute (monitoring and research).

Timetable: 2012– (ongoing).

13.3 Implement special measures: signal crayfish

The spreading of the harmful impacts of the signal crayfish will be contained. The Fisheries Administration Crayfish Strategy 2000 will be updated to redefine areas with a noble crayfish population where it is prohibited to introduce signal crayfish. Even in areas where signal crayfish are already established, no new stocking permits will be issued unless it can be demonstrated that such stocking would be risk-free. Biological factors limiting the spreading of the signal crayfish will be investigated. Points addressing the signal crayfish will be required to be included in the management and treatment plans of fishing regions.

Actors: Ministry of Agriculture and Forestry (legislative amendments concerning stocking permits,

strategy), regional fisheries authorities at Centres for Economic Development, Transport and the Environment (permits, control, implementation instructions, strategy), fishing regions (management and treatment plans), Finnish Game and Fisheries Research Institute (monitoring and research).

Timetable: 2012– (ongoing).

13.4 Implement special measures: crayfish plague, type As and type Ps1

In case of an outbreak of crayfish plague, publicity will be arranged concerning the disease and its risks of local transmission. The possibility of eradicating latent crayfish plague in specific waterways will be investigated. General instructions will be prepared for various actors in the fisheries sector, together with an obligation to report outbreaks. Instructions concerning the taking and submitting of samples related to crayfish plague will be specified. Crayfish catching and how crayfish should be kept must be provided for in the overall reform of the Fishing Act to prevent migration of the disease.

Processing of crayfish plague samples, health monitoring of crayfish farming, maintaining the database of outbreaks and reporting on diseases as required by international conventions.

Actors: Ministry of Agriculture and Forestry (legislative measures) and regional units of Finnish Food Safety Authority Evira (research).

Timetable: 2012– (ongoing).

13.5 Implement special measures: reed sweetgrass

The reed sweetgrass will be monitored in accordance with the instructions being prepared for the monitoring of the EU Water Framework Directive. Spreading of the species will be limited by increasing public awareness of its harmful impacts. Eradications will be carried out by dredging in limited areas. Regulation of regulated waterways will be developed so as to bring the spring flood forward so that the reed sweetgrass cannot acquire a competitive advantage over other water plants. Research and development on eradication methods and commercial use will be undertaken.

Distribution data will be regularly updated to databases at natural history museums and, in the future, to the invasive alien species portal.

Actors: Ministry of the Environment (monitoring of the EU Water Framework Directive, waterway regulation), Finnish Environment Institute (publicity, monitoring, research, steering), Centres for Economic Development, Transport and the Environment (publicity, detection, eradication), Metsähallitus (eradication and prevention in nature conservation areas).

Timetable: 2012– (ongoing).

13.6 Implement special measures: Canadian waterweed

The Canadian waterweed will be monitored in accordance with the instructions being prepared for the monitoring of the EU Water Framework Directive. Spreading of the species will be limited by increasing public awareness of its harmful impacts. The species will be eradicated where its (temporary) restriction is possible. Research and development on eradication methods, spreading strategies and biological control will be undertaken.

Distribution data will be regularly updated to databases at natural history museums and, in the future, to the invasive alien species portal.

Actors: Ministry of the Environment (monitoring of the EU Water Framework Directive), Finnish Environment Institute (research, development), Centres for Economic Development, Transport and the Environment (detection, instructions for implementation, eradication).

Timetable: 2012– (ongoing).

14 ADDRESS THE HARMFUL IMPACTS OF INVASIVE ALIEN LAND VERTEBRATE SPECIES

Target

The target is to slow down and prevent the spreading of established invasive alien land vertebrate species, to eradicate or reduce populations of invasive alien species, to reduce the cross-breeding of populations of foreign origin with indigenous ones, and to enhance the protection of rare indigenous species. A further target is to prevent new alien land vertebrate species from escaping into the wild.

No more pets will be allowed to be released into the wild so as to avoid introduction of alien species and to prevent their potential harmful im-

pacts. This will also reduce the risk of pets going feral, which complicates the monitoring of diseases and other problems.

Impacts

Invasive alien land vertebrate species will not be able to cause harm to indigenous species or the economy. The emergence of new populations of alien land vertebrate species will be prevented. Some measures are difficult to implement, because some of these animals live in urban areas where hunting is tricky to arrange and where people may want to 'help' these animals by feeding them, for instance. An effective publicity and education system is needed to support these measures.

Implementation

14.1 Ensure culling of small predators: [American] mink and raccoon dog

The game administration will be encouraged to promote trapping of [American] mink and raccoon dog as a form of waterfowl game management outside nature conservation areas. Waterfowl populations in national parks in the archipelago, in other nature conservation areas managed by Metsähallitus and also in nature conservation areas on private land will be protected by continuing trapping of [American] mink and raccoon dog as an environmental administration measure, in co-operation with hunters.

Hunters will be encouraged to enhance trapping of invasive alien species. More efficient trapping equipment and methods will be developed to eradicate invasive alien species, and the use of otherwise prohibited equipment and methods in eradicating same will be explored. (Cf. measure no. 1.)

Actors: Ministry of the Environment (safeguarding the species inventory in national parks and nature conservation areas, permits exempting from hunting season restrictions), Ministry of Agriculture and Forestry (legislation), Finnish Game Centre and nature conservation area administration (Metsähallitus, Centres for Economic Development, Transport and the Environment) and hunters' associations (trapping campaigns, co-ordination), hunting associations, parties and individual hunters (trapping, development of trapping equipment).

Timetable: 2012– (ongoing).

14.2 Prepare management plan for population: common rabbit, [American] mink, raccoon dog, North American beaver and others

Management plan for population will be prepared for current invasive or potentially harmful alien species, detailing population control, limitation of propagation, culling and eradication.

Propagation will be limited by enhanced trapping and by selection of locations for eradications (e.g. bird wetlands).

Any new populations of invasive alien species will be eradicated immediately. The North American beaver should be eradicated from western Lapland and the raccoon dog from the Quark area to prevent their spread to Norway and Sweden.

Actors: Ministry of Agriculture and Forestry and Ministry of the Environment (population control plans, legislation), Metsähallitus (population control plans, promotion of measures), Finnish Game and Fisheries Research Institute (research), Centres for Economic Development, Transport and the Environment, Finnish Game Centre and local authorities (trapping, regulation).

Timetable: 2013–2016.

14.3 Regulate farming of game and household animals and improve pet advisory services

Legislation concerning farming of game and household animals (including 'semi-tame' variants such as farm-bred wild boar and dog-wolves) will be improved for instance with regard to control in order to prevent the escape of species into the wild; restocking and game stocking will be required to be done with individuals of an approved provenance (e.g. mallard duck, grey partridge and mallard-domestic duck cross-breeds).

Dog-wolves and feral dogs will be eradicated from the natural environment.

A voluntary 'code of conduct' will be established for pets and household animals, or a volunteer organisation similar to the Animal Disease Prevention Association will be set up to provide advisory services regarding the import, sale and keeping of animals.

Species unsuitable as pets will be defined and their import, sale and marketing will be restricted, considering the risks of such a pet being released or escaping into the wild; this includes pets imported through online commerce.

More public education will be provided concerning the ethical termination of pets and responsible animal ownership, preventing the intentional release of pets into the wild.

Actors: Ministry of Agriculture and Forestry, Finnish Game Centre, game farms, domestic zoos and other zoos (operating model, control, advisory services), pet associations and pet entrepreneurs (creation of operating model, practical operations), definition of species unsuitable as pets, and regulation proposals (Invasive Alien Species Body), veterinarians and animal protection associations (education concerning the ethical termination of pets).

Timetable: 2012–2015: operating model; 2012–(ongoing): control of game and household animal farming.

15 ADDRESS THE HARMFUL IMPACTS OF INVASIVE ALIEN LAND PLANT SPECIES

Target

The target is to increase awareness among the general public and among actors in the horticulture sector concerning the harmful impacts of certain garden plants on the natural environment in order to prevent the spreading of invasive alien species at an early stage and to encourage citizens to take action against them themselves. The dumping of garden waste in the wild will be prohibited. With good planning and long-term effort, hogweeds can be eradicated at least at some locations. Citizens will become more active in combating invasive alien plant species. Special attention will be paid to the combating of invasive alien species in the management of nature conservation areas, recreational areas and commercial forests.

Impacts

The most significant pathways for invasive alien plant species will weaken or disappear, and the spreading of these species in the wild will slow down. The flora of nature conservation areas and recreational areas will develop in its natural state. Measures against invasive alien plant species in agricultural environments will become more efficient, and their spreading will slow down. Measures taken against hogweeds and other invasive alien plant species will become more systematic, and citizens will know better whom to contact locally.

Implementation

15.1. Increase awareness of the importance of garden waste as pathways for invasive alien plant species and investigate obstacles to the proper disposal of garden waste

Information about the proper disposal of garden waste will be published regularly. Problem points in the management of garden waste will be explored and solved. The handling of garden waste at landfills will be managed so that movement of species from the area is not possible. Collection of garden waste and biowaste will be enhanced and the number of collection points will be increased.

Actors: Ministry of the Environment, local authorities (waste management), housing companies and companies responsible for waste management.

Timetable: 2012–2016.

15.2 Improve processing methods for infill and dumping areas, with specific reference to growth medium purity

The processing of infill and extracted soil generated in earth moving will be planned so as to prevent the spreading of the seeds and other parts of invasive alien plant species and of invasive alien mollusc species (e.g. by dumping the topsoil on the bottom).

Particular attention will be paid to the purity of growth media used for plantings. Customers must demand from their suppliers that their growth media comply with the requirements of the Decree on Fertiliser Products.

Actors: Ministry of Transport and Communications / Ministry of Employment and the Economy, Ministry of the Environment, local authorities (plans), the earth moving industry, Finnish Transport Agency and Centres for Economic Development, Transport and the Environment (roadside plantings and grass sowing), Finnish Food Safety Authority Evira, local authorities and other builders.

Timetable: 2012–2017.

15.3 Augment management recommendations and forest certification criteria for commercial forests and further specify the management of nature conservation areas and recreational areas

A recommendation on the handling of alien shrub species will be added to the management recom-

recommendations for commercial forests in connection with forest management measures.

The eradication of invasive alien plant species will be included in the management of nature conservation areas as a mandatory procedure.

Information on the combating of invasive alien plant species will be included in the management practices for recreational areas.

Actors: Ministry of the Environment (responsibility for nature conservation areas, recreational areas), Forestry Development Centre Tapio and forestry centres (private forestry), Metsähallitus (management recommendations for State-owned commercial forests, nature conservation), PEFC Finland and FSC Finland (forest certification criteria), Centres for Economic Development, Transport and the Environment and local authorities (management of nature conservation areas), and owners / controllers / managers of recreational areas and local authorities (recreational areas).

Timetable: 2013–2016.

15.4 Prepare voluntary code of conduct for the horticulture sector

A voluntary code of conduct will be prepared for the horticulture sector (cf. the Council of Europe's Code of conduct on horticulture and invasive alien plants). This code of conduct will include a list of garden plants or varieties of same that have been found to be safe for the natural environment, as alternatives to species found to be harmful.

The use of indigenous plants in plantings on roadsides and other green areas will be encouraged.

Actors: Central Organisation for Finnish Horticulture, the Finnish nursery stock association [Taimistoviljelijät], Finnish Association of Landscape Industries, Finnish Transport Agency, local authorities, botanical gardens (Finnish Museum of Natural History [museums also in Turku, Oulu, Eastern Finland, Jyväskylä]) (code of conduct).

Timetable: 2013.

15.5 Implement special measures: Japanese rose, large-leaved lupine and Himalayan balsam

Authorities with regional responsibility for collecting information on growths of the most harmful invasive alien plant species (Japanese rose, large-leaved lupine, Himalayan balsam) will be

appointed and tasked with preparing regional action plans against these species and to implement them.

Commercial services for combating invasive alien plant species (hogweeds) will be publicised. Contact information for entrepreneurs specialising in this kind of work will be compiled so that local authorities and private customers can easily find them.

A national action plan for the coasts and the archipelago will be prepared to combat and prevent the spread of the Japanese rose. Funding for this action at the most valuable sites will be provided.

In planting and replanting on roadsides, the Japanese rose will be replaced with new, harmless species.

It will be investigated which varieties of Japanese rose (*Rosa rugosa*) propagate seeds poorly or not at all, and these will be marketed instead of the basic variety.

Sections of road free from lupines will be found and plans made to keep them that way. Measures against lupines will be taken at sites with a valuable natural environment, for instance along roads bordering on heritage biotypes.

Actors: Ministry of the Environment (responsible for co-ordination), Centres for Economic Development, Transport and the Environment, local authorities and Metsähallitus (combating measures, information collecting), Centres for Economic Development, Transport and the Environment, nature and landscape services theme group of the Rural Policy Committee, and regional village consortiums and similar actors (work services), Finnish Transport Agency (instructions for roadside plantings), universities, MTT Agrifood Research Finland and the horticulture sector, and foundations awarding research grants (research).

Timetable: 2012– (ongoing).

16 ERADICATE HOGWEEDS FROM FINLAND

Target

The target is that with good planning and long-term effort, hogweeds can be completely eradicated from Finland. Another target is that the hogweed eradication project will form a national pilot

project, setting a benchmark for combating other species.

Impacts

The most significant pathways for hogweeds will weaken or disappear, and the spreading of these species in the wild will slow down and eventually stop. Measures taken against hogweeds will become more systematic, and citizens will know better whom to contact locally.

Implementation

16.1 Implement special measures: set the goal of eradicating hogweeds from Finland

A national project against hogweeds will be set up, its purpose being to eradicate hogweeds from Finland. Regional authorities responsible for co-ordinating the effort will be appointed. Citizens will be encouraged to report hogweed stands to the authorities. Sufficient resources will be provided for the project for the gathering of obser-

vation data, the actual combating measures, and monitoring. The project will be timetabled for a sufficiently long period (10 to 20 years) so that the desired result will be achieved. The importance of species identification will be emphasised in the advisory services.

It will still be possible to grow hogweeds subject to a permit for educational and research purposes.

Actors: Ministry of Agriculture and Forestry, Ministry of the Environment (organising funding), Centres for Economic Development, Transport and the Environment (co-ordinating the effort), local authorities and others (combating measures).

Timetable: 2013: planning and launching the project; 2022–2032: hogweeds eradicated (project duration 10 to 20 years). Actions and monitoring on national borders will be ongoing.

The resource costs for the project to eradicate hogweeds are given in Table 9.



Invasive alien species giant hogweed.

PHOTO: TERHI RYTTÄRI

SUMMARY OF MEASURES

All of the measures presented in Finland's National Strategy on Invasive Alien Species are interconnected. Figure 2 illustrates how the measures

and their effects in preventing and combating the threats and harmful impacts of invasive alien species fit together.

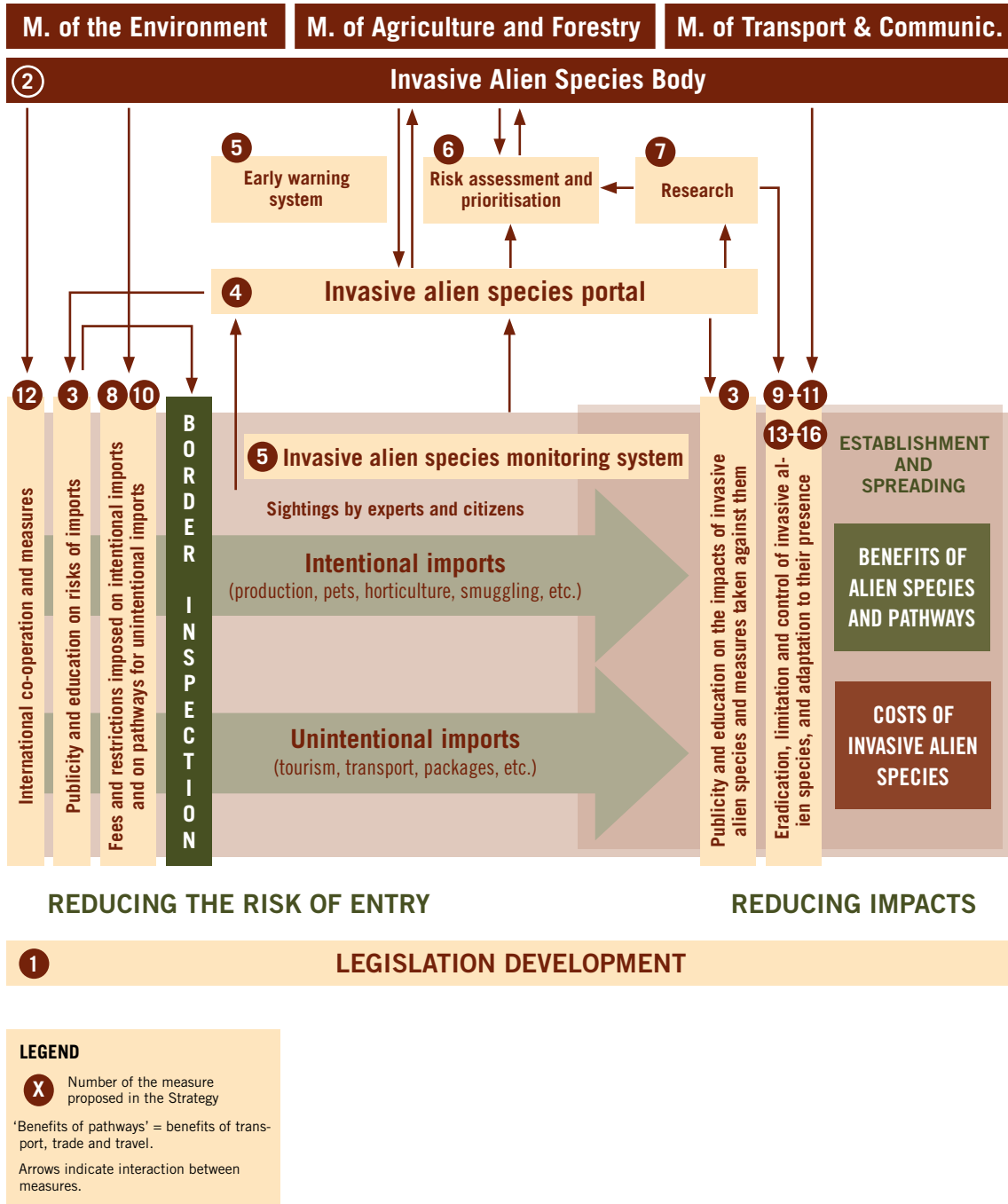


Figure 2: Implementation of measures and responsibilities against invasive alien species. All the measures are interconnected.

As shown in Figure 2, alien species are imported either intentionally (for production use, as pets, as garden plants) or unintentionally with travellers, means of transport or trade packagings. The risk of entry can be reduced by addressing these pathways through publicity and through various control measures (regulations, fees). International co-operation can be leveraged to reduce the risk for Finland and to share worldwide responsibility for preventing the spread of invasive alien species. Efforts will be made in border inspections to detect species entering the country unlawfully. Of the alien species that do manage to enter the country, some will establish themselves and begin spreading. Alien species can be both beneficial (intentionally imported alien species) and harmful. Entry pathways (transport, travel, trade) are also beneficial and cannot feasibly be completely blocked. Prevention and combating may be influenced through publicity and by taking various kinds of action.

All of the measures proposed in the Strategy are based on a reform of the legislation concerning alien species (measure no. 1), which is a fundamental requirement for the implementation of all the other measures. The Invasive Alien Species Body (2) to be attached to the Ministry of Agriculture and Forestry will be the national authority responsible for matters related to invasive alien species. The Body will receive updated information through the early warning system (5), the invasive alien species portal (4), prioritisation of alien species (6) and the risk assessments the Body commissions (6). The Body will formulate preventive measures involving imports and pathways for unintentional importing, targeted at specific species and channels (3, 8, 10). As post-entry measures, the Body will control and coordinate measures for the eradication, limitation and control of invasive alien species, and adaptation to same (3, 9–11, 13–16). In co-operation with international actors, the Body will ensure that Finland does not contribute to the spread of invasive alien species beyond Finland's borders (12).

The invasive alien species portal (4) will play a vital role in the measures proposed. The data in the portal are available to the Invasive Alien Species Body, and the Body will use the portal as one of its publicity channels. The portal will also include information on the early warning system (5), the invasive alien species monitoring system (5) and observations by experts and citizens. The portal will generate information to support publicity, regarding both the invasive alien species risk prevention and mitigation of their harmful impacts. Invasive alien species research (7) will support risk assessment and measures taken against invasive alien species.



On the left Darube crayfish (*Astacus leptodactylus*), in Finland a potentially or locally harmful alien species, on the right signal crayfish (*Pisifastacus leniusculus*), an invasive species and in the middle the non-harmful noble crayfish (*Astacus astacus*). PHOTO: JOUNI TOLONEN

FUNDING ALTERNATIVES RELATING TO ALIEN SPECIES

Alongside traditional funding sources there are various new ways for obtaining funding for action against invasive alien species. National and

EU-level funding channels may play a part in this. Table 8 shows an overview of potential new funding sources proposed in the EU that can be leveraged to augment current resources or to replace earlier funding sources.

Table 8. Proposals for means of funding to combat invasive alien species made in the context of the preparation work on invasive alien species in the EU.

How can action against invasive alien species be funded?

- Taxes and fees for importers on intentional imports of alien species
 - general import taxes and fees (import duties, inspection fees, quarantine fees)
 - fees based on volume or risk of imports
 - fees for risk assessment and official actions related to importing (i.e. the importer is liable for costs incurred by the relevant authority in connection with the importing)
 - permit, registration and testing fees related to temporary keeping of an alien species
 - compensation for costs incurred through the management and/or destruction of transport materials such as contaminated soil
 - compensation for costs incurred through monitoring of an imported alien species, including monitoring planning
 - compensation for costs incurred through prevention and combating of the spreading of an imported alien species, e.g. an insurance premium
- Taxes and fees for importers on unintentional imports of alien species
 - taxes and fees on transport materials or host organisms enabling migration, including risk assessment fees
 - targeted fees on goods and packagings from origins or made of materials involving an extremely high risk
 - insurance payments related to potential consequences of importing
- Sanctions for violating the provisions on intentional and unintentional imports or for neglecting payment of fees
- Tax rebates for eradication of invasive alien species: costs incurred through voluntary action to eradicate invasive alien species or to control populations of same could be declared tax-deductible, for instance in the household deduction or in forest taxation
- 'Rapid response fund': Rapid response to eradicate an invasive alien species detected in Finland equires resources that are immediately available. For this purpose, a 'rapid response fund' could be set up (cf. the Oil Pollution Fund and flood protection funds). In addition to contributions from public funds, some of the revenue from taxes, fees and fines related to the importing of alien species could be paid into the fund.
- 'Easement fund': Voluntary action to combat invasive alien species could be rewarded with credits that could be set off against fees for unintentional imports, for instance.

How can, or could, responsibility concerning invasive alien species be defined?

- Directive 2008/56/EC of the European Parliament and of the Council establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) allows for application of the 'polluter pays' principle, for instance in transport material fees, special cargo fees, insurance premiums and regulation fees.
- The strict liability system outlined in Annex III to the Environmental Liability Directive (2004/35/EC) could be extended to other professional areas involving high invasive alien species risks (strict administrative liability in professional activities related to alien species).
- A general responsibility of ensuring safety in activities that could result in the release or escape of invasive alien species into the wild (general responsibility in activities related to alien species production). This could be implemented through a permit system and/or codes of conduct determining threshold values for what is appropriate and what is negligent (provisions for estimating reasonableness and degree of negligence).
- Development of insurance products covering invasive alien species risks should be encouraged so as to a) improve and ensure access to foundations administering the combating of invasive alien species and the repair of their harmful impacts, and b) encourage actors to comply with best practices and standards.
- Amending provisions on invasive alien species to Annex A of the Directive on the protection of the environment through criminal law (2008/99/EC).

ANTICIPATORY PREVENTION IS THE MOST COST-EFFECTIVE

It has been noted, for instance in connection with the EU work on invasive alien species, that the resources required for prevention of invasive alien species are considerably lower than the costs incurred through the harmful impacts of same. It is also known that prevention is generally much more cost-effective than corrective action. How-

ever, in a case where an invasive alien species has already entered an area, early detection and rapid eradication are the most cost-effective ways of preventing it from establishing itself and spreading further. Conscious risk-taking in the interests of saving on costs may prove to be disastrously short-sighted, as available data on the significant damage caused by invasive alien species indicate that correcting harmful impacts after the fact is not only very expensive but often nearly impossible.

An example of correcting harmful impacts after-

An example of early detection and eradication (Approach II): Downy ryegrass (*Leymus innovatus*)

In 1999 a plant species that was new in Finland, downy ryegrass (*Leymus innovatus*), was found on the roadside in the Oulanka National Park. In its area of origin in Canada and northern parts of the United States it grows on sandy soil in meadows, forests and riversides. The conservation biologist of the Oulanka National Park studied the properties of the species in further detail. Downy ryegrass is a tall, up to a metre high grass plant which grows very strongly. It spreads both by seeds and via its strong root system, and it may even survive forest fires. Based on this it was concluded that very likely the downy ryegrass would spread by itself or via tourists from the national park to nature, especially to valuable sandy riversides, which are a habitat for numerous endangered species. The public authorities eradicated downy ryegrass from the place where it was found in one day in 2004. Had the plant spread to the sandy shores of the Oulankajoki river, eradicating it would have been much more difficult and costly, or even impossible.

Source: Jäkäläniemi, A. 2005. Albertanvehnän poisto Oulangan kansallispuistosta. Lutukka 21:30-31 (in Finnish).

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wards in Finland, and the costs incurred, is given in Table 9. Combating and eradicating hogweeds is now considerably more expensive than if their entry had been actively prevented for instance by prohibiting their import and distribution.

The planning and targeting of measures against invasive alien species usually requires a systematic risk assessment. As far as hogweeds are concerned, we have information on their harmful impacts and expert evaluations of measures taken against them and their effects. Judging by this information, a nationwide project for combating hogweeds is justified. Implementation of the measures should be monitored and experiences gathered of the costs of individual measures, the distribution of their costs, their effectiveness and any side effects. Monitoring data will enable the measures to be revised so to be as cost-effective as possible while allowing identification of the most effective action.

OFFICIAL RESPONSIBILITIES FOR INVASIVE ALIEN SPECIES, AND OTHER ACTORS INVOLVED WITH INVASIVE ALIEN SPECIES IN FINLAND

The Ministry of Agriculture and Forestry is responsible for action concerning alien species in agriculture, forestry, game management and fisheries and also assumes overall co-ordination of all action against invasive alien species. The Ministry of the Environment is responsible for alien species listed under the Nature Conservation Act. The Ministry of Transport and Communications co-ordinates invasive alien species issues related to road management, transport routes and shipping. The Ministry for Foreign Affairs is responsible for invasive alien species issues related to development co-operation projects. These official responsibilities are also listed in part I (Table 1). Co-operation with local government and local environmental and health care authorities is also important and will be continued.

Table 9. A national project to prevent giant hogweed.**Target: Eradicate hogweeds from Finland by 2025**

Hogweeds are among the most harmful invasive alien species occurring in Finland. They pose a threat to the natural environment and a health hazard to humans while also lowering property values; moreover, they are expensive and laborious to eradicate. However, over the years a considerable amount of knowledge and expertise has been accumulated in combating hogweeds, and there are ongoing regional projects taking action against them. If desired and so decided, it could be possible to completely eradicate hogweeds from Finland.

What would a nationwide project to eradicate hogweeds require?

- Preparation of instructions on how to identify hogweeds.
- Collecting of growth data (locations and extent) for the entire country.
- Regional co-ordination (e.g. the environment and natural resources areas of responsibility of the Centres for Economic Development, Transport and the Environment or, under a separate project organisation, another actor with a comprehensive regional network).
- Active encouragement of the participation of local authorities and NGOs (e.g. village associations).
- Sufficient funding to enable the use of outsourced services in eradication measures as necessary.
- Monitoring of stands at least 7 years after the first combating measures.
- Publicity and communications campaigns, and instructions for volunteer action (brochure for the general public).

What would it cost to eradicate hogweeds?

- The eradication cost per stand is EUR 500 on average (depending on the size of the stand). By a rough estimate, there are 10,000 stands of hogweed in Finland.
 - Eradication costs EUR 5 million (outsourced services, subsidised employment, volunteer work).
 - Work input of regional co-ordinators (10 to 15 person-years * 5 years for the duration of the eradication action nationwide, after which the input can be less)
 - Work input EUR 5 million (over 10 years). Potential for allocating posts vacated or resources freed elsewhere in the co-ordinating organisations for this work must be explored, including the potential for networked co-ordination, with part of the work being done by the local authorities.
 - Funding for sufficiently long monitoring and aftercare.
 - Monitoring and aftercare EUR 2 million.
- Rough cost estimate: Total EUR 12 million over 10 years, i.e. EUR 1.2 million per year for the entire country; the co-ordinators could also oversee actions against other invasive alien species besides hogweeds. The cost will depend crucially on how much volunteer work is input and how the co-ordination is managed.

The hogweed eradication project will form a national pilot project, setting a benchmark for combating other species.

There are many other actors in Finland that participate in action related to alien species at various levels. Such action includes prevention of harmful impacts of invasive alien species; identification and combating of threats and risks; early detection and eradication of invasive alien species; and prevention of the spreading of invasive alien species already established and spreading in Finland, and the related ongoing management of their harmful impacts.

4. Survey on measures against invasive alien species conducted among bodies participating in the working group drafting the Strategy, local authorities and Centres for Economic Development, Transport and the Environment in September 2010.

Current action against invasive alien species

Current measures against invasive alien species in Finland focus on anticipatory prevention, early detection and eradication, and prevention of spreading.⁴ **Anticipatory prevention** of the harmful impacts of invasive alien species, together with threat and risk assessments, subsumes a wide range of current measures, including publicity (also online), research, information collecting, teaching, monitoring, management and treatment plans, operations policy development, legislation enforcement and development, risk assessment and control development, permit decisions and inspections for instance at borders. The Finn-

ish authorities also participate in regional, EU-level and international co-operation to combat the harmful impacts of invasive alien species.

Early detection and eradication includes individual measures undertaken to monitor and inspect certain species and their occurrences, eradication actions and targeted management measures.

Control and prevention of the spreading of invasive alien species already established and spread-

ing in Finland include eradication, destruction and other combating measures (e.g. against hogweeds, the large-leaved lupine, Himalayan balsam, wild oat, plant diseases and plant pests) and culling of small predators ([American] mink, raccoon dog, feral cats, North American beaver), involving volunteer work and co-operation with hunters.

Table 10. Action against invasive alien species in Finland.

Actor	Threat and risk assessment and anticipatory prevention	Early detection and eradication		Prevention of spreading of invasive alien species already established in Finland, and ongoing measures
		Detection	Eradication	
Centres for Economic Development, Transport and the Environment	•	•	•	•
Finnish Food Safety Authority Evira	•	•	•	•
NGOs (e.g. Finnish Association for Nature Conservation)	•	•	•	•
Ports with international traffic		•	•	•
Local authorities	•	•	•	•
Finnish Transport Safety Agency	•			
Finnish Museum of Natural History	•	•		
MTT Agrifood Research Finland	•	(•)	(•)	
Metsähallitus		(•)	(•)	•
Finnish Forestry Centre	•	•		•
Finnish Forest Research Institute (Metla)	•	•		
Central Organisation for Finnish Horticulture	•	•		
Finnish Game and Fisheries Research Institute	•	•		
Finnish Wildlife Agency	•	•	•	
Finnish Environment Institute	•	•		
Customs	•			
Universities	•	•		

(•) = to a minor extent

Volunteer work and NGO activities

There are numerous NGOs that can help in implementing Finland's National Strategy on Invasive Alien Species. Almost all NGOs are capable of organising prevention and combating action for instance through their websites, advisory services, seminars, talks, excursions, bulletins and environmental education. Environmental organisations and scientific societies can help in the early detection and monitoring of species. The most extensive database of sightings available to NGOs is Tiira (BirdLife Suomi), which allows monitoring of data almost in real time for instance on the bar-headed goose. Volunteer help may be enlisted for the eradication or culling of invasive alien species that have already spread to Finland. Examples of include projects to maintain heritage landscapes, organised by environmental organisations, and trapping campaigns against alien species, organised by hunting organisations.

The majority of alien species in Finland are plants. Many invasive alien plant species are garden plants originally planted intentionally. Thus, horticultural organisations and associations are among the most important target groups and actors in the field of invasive alien species issues. Plenty of training seminars, fairs and talks are organised in this field, and through entrepreneurs in this sector information and measures reach other enterprises, communities and private individuals. The Martha Organisation and agricultural and household advisors make contact with a wide range of civic groups. The Finnish House Owners' Association is an umbrella organisation for local house owners' organisations and therefore for private gardeners. The Allotment Gardens Association brings together local allotment garden associations and the Finnish Local Heritage Federation brings together city district associations; both organisations include private gardeners in their membership. Gardening is an essential feature in the activities of the Finnish Landrace Association and the Association of Useful Plants. All of the above organisations are capable of providing advice and education and organising volunteer projects for eradicating invasive alien species. Possible actions in horticulture include anticipatory prevention, combating, early detection, eradication and control.

Hunting organisations can, through their membership, conduct observations over broad tracts of land and contribute to the restriction or eradi-

cation of invasive alien species. Possible measures include early detection, eradication and control. Fisheries organisations can, through their membership, conduct widespread observations and to some extent contribute to removals, particularly in inland waterways. Possible measures include anticipatory prevention, combating and early detection and, in the future, reporting through the invasive alien species portal.

Water protection associations and several consultants in the sector mainly monitor water quality but also the organisms that live in the water and on the shores. Water protection associations and related companies conduct statutory load, waterway and fisheries monitoring, studies of algae and lakes, and investigations of water plants and bottom fauna. Possible measures include early detection and monitoring and, in the future, reporting through the invasive alien species portal.

Associations for breeders of exotic pets can reach people who in the future might potentially release new alien species such as aquarium fish into the wild. Possible measures include anticipatory prevention and combating.

Key NGOs in this sector are the Finnish Association for Nature Conservation (FANC), BirdLife Finland, Natur och Miljö, the Central Organisation for Finnish Horticulture, the Finnish Association of Landscape Industries, the Allotment Gardens Association, the Finnish Landrace Association, the Association of Useful Plants, the Finnish Hunters' Association, the Federation of Finnish Fisheries Associations and its member associations, the Finnish Federation for Recreational Fishing, the Finnish Fish Farmers' Association, the Central Union of Agricultural Producers and Forest Owners (MTK), the Federation of Finnish Water Protection Associations, scientific societies, the Martha Organisation, the Rural Women's Advisory Organisation and ProAgria Advisory Centres.

MONITORING THE IMPLEMENTATION OF THE STRATEGY

It is proposed that the monitoring of Finland's National Strategy on Invasive Alien Species be assigned to the Invasive Alien Species Body (see measure no. 2). The monitoring will comprise monitoring of the implementation of the Strategy,

monitoring of the effectiveness of the measures outlined in the Strategy, and identifying of eventual research needs related to monitoring.

The monitoring of the strategy will require the development of appropriate indicators (see e.g. Figures 3 and 4) and a pre-agreed approval procedure for this set of indicators.

There is also a need for conducting a more in-depth impact assessment concerning the success, targeting and effectiveness of the measures.

It is proposed that the interim evaluation of the Strategy be carried out during 2016.

Other monitoring of alien species related to the Strategy includes monitoring of alien species in-

ventories, including changes in distribution ranges and in harmful impacts. Monitoring must be intensive over the first few (2–4) years, while the current state of the occurrence of alien species is being investigated. Thereafter, monitoring is meant to be focusing on changes, i.e. monitoring the alien species inventory and the impacts of alien species and of combating measures.

It is proposed that the monitoring of alien species be improved by leveraging existing, established monitoring methods (measure 5.2). Also, to improve monitoring, the practice(s) best applicable for the monitoring of alien species will be investigated.

Table 11. Example of the current stage of the monitoring of alien species and its development.

Detecting alien species in the course of monitoring in the Baltic Sea (preliminary findings from the VISEVARIS research project)

One third of the alien species living in our sea areas have never been observed in monitoring, and a relatively good notion of the occurrence of only a few alien species can be gained with the current level of monitoring. The alien species least likely to be detected include fish, invertebrates living on the bottom in shallow waters and animals attaching themselves to hard underwater surfaces.

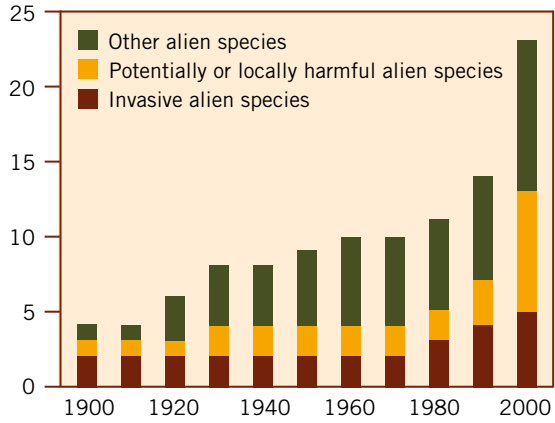
Monitoring of phytoplankton and bottom animals is regionally quite comprehensive along Finland's coast. Monitoring of zooplankton, water plants, macroalgae and fish schools is generally confined to the southern sea areas. The majority of observations of alien species come from projects outside the monitoring proper and from one-off studies.

Better detection of alien species would require improvement of catching methods on the one hand and a denser network of sampling on the other. There is also a need to improve the storing of the results of monitoring conducted by officials and the availability of this material.

At the luonnontila.fi website, research-based and up-to-date data on the state of Finland's natural environment and trends therein are followed using indicators. These indicators depict the state of the natural environment for instance by reflecting changes in populations of a group of species living in a specific habitat. The website is also used to

monitor alien species trends in Finland using various indicators. Monitoring indicators are already in preparation (see Figures 3 and 4), and new indicators are being planned. It is recommended that other indicators useful for the monitoring of alien species be developed.

A Alien species by decade of entry



B Number of alien species in sea areas

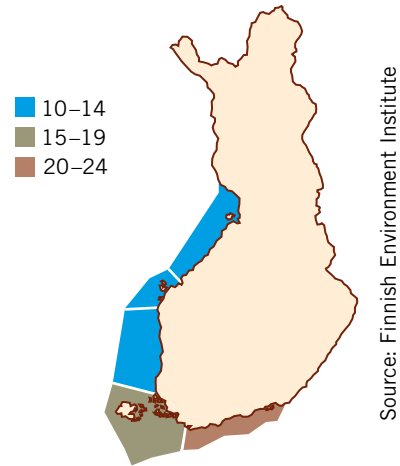
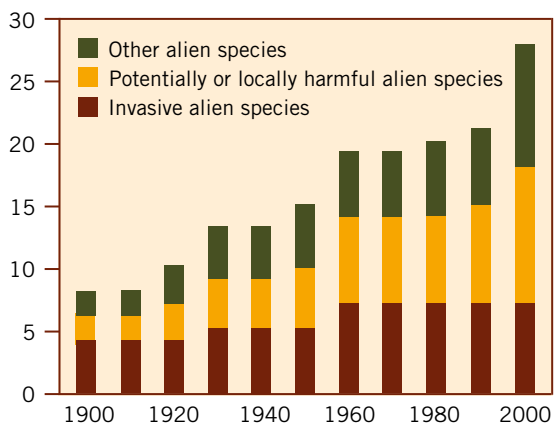


Figure 3. Monitoring indicator on alien species trends in the Baltic Sea. (luonnontila.fi)

A Alien species by decade of entry



B Number of alien species in inland waterways

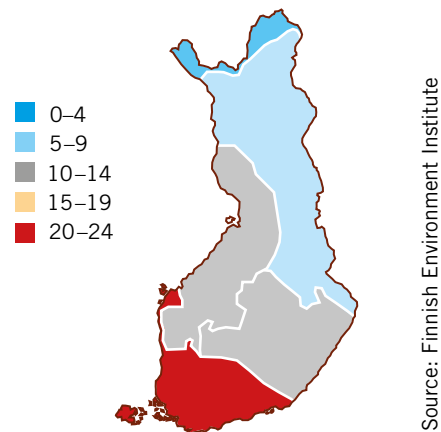


Figure 4. Monitoring indicator on alien species trends in inland waterways. (luonnontila.fi)

APPENDICES

- I National legislation addressing invasive alien species
- II Invasive alien species portal alert functions and operating responsibilities, with recommendations regarding the information content and functions of the portal (see measure 4 in the Strategy)
- III Alien species risk assessment: Concepts and stages in risk assessment; terminology
- IIIa Risk assessment procedure: Description of measure 6.1
- IV Working group and experts who prepared the proposal Strategy
- V Experts heard during the preparation of the Strategy, and experts in sub-groups contributing to the preparation of the Strategy
- VI Background materials used in the preparation of the Strategy

APPENDIX I: National legislation addressing invasive alien species

Nature Conservation Act (1096/1996)

Section 43: Preventing the spreading of non-native species

Non-native species falling outside the purview of the Hunting Act or Fishing Act are not to be released into the wild if there is cause to suspect that the species may become established permanently. Non-native plant species without an established range in the Finnish wild are not to be planted or sown outside a garden, field or other site designated for special purposes, nor in natural waters, insofar as there is cause to suspect that the species may become established permanently. This shall not apply, however, to the planting or sowing of trees for the purpose of forestry.

If a non-native plant or animal species is known to spread rapidly in the wild, and there is reasonable cause to suspect that it might constitute a health hazard or have a detrimental effect on an indigenous Finnish species, the Ministry of the Environment may issue any regulations as prove necessary for preventing the spread of such a species. Measures for preventing the spread of animal disease are set forth in the Animal Diseases Act.

Section 15: Derogations subject to special permit

With permission from the authority or agency in charge of the site, the following is permitted in a national park or strict nature reserve, provided that the site's conservation objectives are not jeopardised:

2) controlling the population of a plant or animal species that has increased detrimentally or otherwise constitutes a nuisance;

Hunting Act (615/1993, 915/2011)

Section 42: The import and release to the wild of animals of foreign origin

It is forbidden to import or release to the wild bird or mammal species of foreign origin as well as game strains of foreign origin without the permit of the Ministry of Agriculture and Forestry. A statement on a permit application must be requested from the Ministry of the Environment and the Finnish Environment Institute. The permit must be refused if significant harm will be caused by the measure to the natural environment or fauna. Provisions on how

import and release to the wild are to be carried out may be laid down in the permit.

The provisions of subsection 1 also apply to bringing an animal from Åland to another part of Finland and to the release of the animal to the wild there.

Fishing Act (286/1982, 252/1998)

Section 94 (252/1998)

The import of fish or crayfish below the decreed size for purposes other than planting, scientific research or transportation as transit goods is prohibited. The same applies to the import during the close season of fresh fish and crayfish protected by decree. If necessary, further provisions on the application of these prohibitions shall be provided by decree.

The import of a fish or crayfish species not occurring naturally in Finland or of their stock or gametes is allowed only by permission of the Ministry concerned and on the terms and conditions specified by it. Permission must be denied if the measure may cause significant harm to nature or wild animals. Provisions on fish or crayfish species that can be imported freely shall be given by decree as necessary.

Section 121 (252/1998)

Introduction of a new fish or crayfish species or its stock into a water area, or a transplantation of fish or crayfish to the area is subject to a permit of the Employment and Economic Development Centre. The permit may contain provisions on the carrying out of the measure.

Forest Act (1093/1996)

Section 8a(5): Growing new tree stock

The measures referred to in this section and the deadlines for their implementation, the reasonable period of time for growing a seedling stand, and grounds for evaluating seedling stands may be provided for in more detail by decree and regulated by decision of the competent Ministry in forestry matters based on such a decree. The Ministry may issue more detailed instructions on the use of tree species not indigenous to Finland for forest regeneration and the use of vegetatively propagated forest regeneration material.

Section 8a(3) (entered into force on 1 January 2011)

... the use of tree species not indigenous to Finland for forest regeneration will be provided for in more detail by a Government Decree as necessary.

Plant Propagation Material Act (1205/1994)

Section 1: Scope of application

This Act shall apply to the production, import and marketing of horticultural plant propagation material. This Act shall further apply to the export of plant propagation material to the European Economic Area insofar as required by international treaties binding upon Finland. This Act shall not apply to the marketing, production or import of plant propagation material in small quantities not undertaken professionally.

Section 6: Suitability for Finland's growing conditions

The Plant Production Inspection Centre shall issue and publish recommendations on plant propagation material of fruit trees and berry plants for outdoor planting and on plant propagation material of biennial and perennial ornamental plants. Suppliers of plant propagation materials must post the recommendations of the Plant Production Inspection Centre in view of customers at their points of sale.

This Act contains further provisions on the production, storage, import and marketing of plant propagation material and requirements for the quality and health of same.

Act on Trade in Forest Reproductive Materials (241/2002)

Section 1: Scope of application

The provisions of this act apply to the production, marketing and import of forest reproductive material.

This Act implements Council Directive 1999/105/EC on the marketing of forest reproductive material.

Animal Disease Act (55/1980)

Section 12g (303/2006)

Animals and animal products that may cause an animal disease as referred to in section 3(2), or involving the risk of the spreading of a severe animal disease not occurring in Finland, may only be imported from other EU Member States to Finland or exported from Finland to other EU Member States by an operator duly registered with the Finnish Food Safety Authority Evira. [Terms and conditions related to the register in sections 12g and 12h.]

The more detailed provisions required by EU law on animals and animal products to whose import and

export subsection 1 applies shall be provided by a Decree of the Ministry of Agriculture and Forestry.

Section 13 (809/1992)

The transfer, transport, export, import and transit of animals, animal products, animal waste and any other objects or goods that may transmit animal diseases may be provided for by decree.

A decree may also authorise the Department of Food and Health of the Ministry of Agriculture and Forestry to issue regulations concerning the matters referred to in subsection 1. (424/1994)

Notwithstanding the provisions of subsections 1 and 2, the provisions of the Act on Veterinary Border Inspection (1192/1996) shall be complied with regarding animals imported from outside the European Community and regarding the terms and conditions of import and border inspection procedures for the other objects and goods referred to in subsection 1. However, in the case of Norway, Iceland and Liechtenstein, these requirements shall be provided for pursuant to this Act to the extent required in the Treaty on the European Economic Area. (804/1999)

Section 14a (408/2008)

Fish, crayfish living in water and molluscs, and fertilised gametes of same, may be grown for human food, for sale or for transfer to further growing or stocking in the sea or in waterways only by operators duly authorised by the Finnish Food Safety Authority Evira. However, a permit shall not be required if such operations are intended only:

- 1) to grow fish, crayfish or molluscs for human food for the grower's own consumption, or for providing in small quantities directly to consumers or to local retailers for sale to consumers,
- 2) to grow ornamental fish, crayfish or molluscs in aquariums or similar tanks, ponds or pools from which water is not conveyed into the sea or waterways without cleaning,
- 3) to grow fish or crayfish in ponds for recreational fishing purposes so that they are not transferred from those ponds for further growing or stocking, or
- 4) to grow molluscs for the purposes of water treatment.

Act on Preventing Wild Oat (185/2002)*Section 2: Scope of application*

This Act governs measures that are used to control wild oat and prevent its spreading.

Section 4: Obligation to undertake combating action

Parties in possessions of a cultivated field or areas immediately adjacent to same shall take any and all action required to prevent the occurrence and spreading of wild oat.

More detailed provisions on the combating of wild oat and of preventing its spreading on cultivated fields and areas immediately adjacent to same shall be issued by a Decree of the Ministry of Agriculture and Forestry.

Section 5: Notification obligation

Any party who knows or suspects that there is a previously unreported growth of wild oat in an area which that party controls shall immediately notify thereof the agricultural economic development authority in the municipality in which said growth is located.

Any official or authorised inspector who notices a growth of wild oat in connection with any other inspection or measure undertaken in an area shall immediately notify thereof the agricultural economic development authority in the municipality in which said growth is located.

More detailed provisions on the content of such a notification and the notification procedure shall be issued by a Decree of the Ministry of Agriculture and Forestry.

Seed Trade Act (728/2000)*Section 2: Scope of application*

This Act shall apply to the production, marketing, import and export of planting seeds of arable crops and garden plants. More detailed provisions on the application of this Act to the transfer of planting seeds to farmers on the basis of a cultivation agreement and the terms and conditions of such application shall be issued by a Decree of the Ministry of Agriculture and Forestry.

Section 4: Certified planting seeds

Only certified planting seeds may be marketed. More detailed provisions on requirements for the varietal purity and quality of certified planting seeds and other criteria for certification, on the certifica-

tion of planting seeds, on the marketing in Finland of planting seeds certified in another country, and on requirements for the production, handling and storage of certified planting seeds will be issued by a Decree of the Ministry of Agriculture and Forestry.

By derogation from subsection 1, the following may be marketed without certification:

- 1) small quantities of planting seeds for scientific purposes or breeding,
- 2) negligible amounts of other planting seeds for experimental purposes, provided that they are of a variety for which an application for inclusion in the list of varieties referred to in section 5 has been submitted and that the required cultivation value tests have been conducted in two growing seasons,
- 3) non-varietal commercial planting seeds intended for production of grasses, fodder crops, or oil or fibre plants,
- 4) standard seeds of vegetable crops,
- 5) raw batches of seeds supplied for conditioning and packing,
- 6) varietal cereal seed from supply security stocks in a situation where not enough certified planting seeds are available on the market to ensure a sufficient supply of seeds, and
- 7) seeds of landrace plants, in the interests of preserving heritage biodiversity.

More detailed provisions on the marketing of uncertified planting seeds referred to in subsection 2 and on requirements for their varietal purity, quality, production, handling and storage will be issued by a Decree of the Ministry of Agriculture and Forestry.

Section 6: Marketing of varieties

Marketing for a particular variety must indicate whether the suitability of that variety to Finland's growing conditions has been established. More detailed provisions on the content of such a notification shall be issued by a Decree of the Ministry of Agriculture and Forestry.

Section 7: Marketing restrictions on varieties

The Ministry of Agriculture and Forestry may prohibit the marketing of planting seeds of a particular variety of a crop nationwide or in a specific region if:

1) the variety has not been accepted into the list of varieties referred to in section 5, or into the EU or EEA common catalogue of varieties of agricultural plant species, or

2) cultivation of the variety might have plant health implications for the cultivation of other species or varieties of crops.

If a variety is entered in a list of varieties in another EEA Member State or in the EU or EEA common catalogue of varieties of agricultural plant species, the imposition of a prohibition pursuant to subsection 1 shall comply with the procedure specified in the Agreement on the European Economic Area.

Plant Health Protection Act (702/2003)

Section 2: Scope of application

Provisions will be issued by a Decree of the Ministry of Agriculture and Forestry, taking into account international treaties binding upon Finland, concerning which plant pests the measures referred to in subsection 1 may be applied to. The Act may also be applied to the combating and prevention of the spreading of plant pests or other organisms which are new or unpredictable in their impact and which constitute an immediate threat to plant health.

Section 4: Registration obligation

Plants, plant products and any other goods with which plant pests may easily be spread may only be marketed, produced for marketing purposes, stored and imported by operators duly registered with the Plant Production Inspection Centre (plant protection register). However, this registration obligation shall not apply to local marketing or to operators who occasionally import small amounts of such plants, plant products or other goods for their own use. The plants, plant products and other goods to which this registration obligation applies shall be specified by a Decree of the Ministry of Agriculture and Forestry, based on EC regulations on plant health.

Section 6: Marketing

Certain plants, plant products and other goods with which plant pests may easily be spread may only be marketed if they have a plant passport or other phytosanitary certificate, except in the case of local marketing. Every batch of goods being marketed must have a plant passport or other certificate issued in a Member State of the European Union.

Section 7: Import and export

Certain plants, plant products and other goods with

which plant pests may easily be spread may only be imported if they have a plant passport or other phytosanitary certificate. Every batch imported must have a phytosanitary or other certificate.

Before importing goods with a phytosanitary certificate, the operator must notify the Plant Production Inspection Centre thereof.

The Plant Production Inspection Centre, or the agricultural department of an Employment and Economic Development Centre, shall issue a phytosanitary certificate or other certificate referred to in subsection 1 to any goods to be exported from Finland for which the destination country requires such a certificate, provided that the goods comply with the phytosanitary regulations of the destination country for the import of such goods.

Section 10: Notification obligation

Anyone who knows of or suspects the presence of plant pests as defined in a Decree issued pursuant to section 2(3) in a property or part thereof, a cultivated field, a storage facility, a means of transport or a building which they own or control shall immediately notify thereof the relevant Employment and Economic Development Centre or the Plant Production Inspection Centre. This also applies to any official who in the course of his official activities detects the presence of such plant pests. The Employment and Economic Development Centre so notified must in turn notify the Plant Production Inspection Centre of the plant pests.

Section 11: Combating of plant pests

In order to combat plant pests or to prevent their spreading, an official order may be issued:

- 1) requiring a landowner, cultivator or owner or controller of a property or a part thereof to take immediate action necessary for eradicating the plant pests occurring in the property,
- 2) requiring the necessary cleansing or disinfection of a building, piece of machinery, means of transport or any other item contaminated by plant pests, with specifications on the necessary means of cleansing and disinfection,
- 3) requiring the necessary cleansing, disinfection or destruction of plants or of packages or packaging materials of vegetable origin, with specifications on the necessary means of cleansing, disinfection or destruction, or imposing necessary restrictions on the use of plants or of packages or packaging materials of vegetable origin,

- 4) imposing necessary bans, conditions and restrictions on the cultivation, transport or trade of plants,
- 5) imposing necessary action to be taken in connection with the cultivation, harvesting and trade of plants,
- 6) imposing necessary bans or conditions on the marketing, import and export of plants, plant products, herbicides and other products with which plant pests can easily spread, or
- 7) requiring an operator to comply with any restrictions, bans or other action imposed for the purpose of combating plant pests or preventing their spreading.

Section 12: Notification of restrictions of use

Anyone who sells, leases or otherwise transfers to the control of another party a property or part thereof or a building, the use of which is restricted because of the presence of plant pests, shall notify the transferee of such a restriction before the transfer is effected.

The competent authority shall submit information on the presence of plant pests on request in connection with a transfer such as referred to in subsection 1.

Decree of the Ministry of Agriculture and Forestry (866/2008) on the animal disease requirements relating to imports from countries outside the European Community of certain live animals and their embryos and gametes

The import of pets from countries outside the EU (no more than 5 individuals at a time) – dogs, cats, ferrets, invertebrates (except bees and crustaceans), ornamental tropical fish, amphibia, reptiles, birds (except poultry covered in Directives 90/539/EEC and 92/65/EEC), rodents and domestic rabbits – is only allowed through points of entry approved for such imports. The approved points of entry where the customs authorities perform import inspections on pets are listed in Appendix I to Decree 402/2011 of the Ministry of Agriculture and Forestry. In order to import animals of the aforementioned kind from countries outside the EU to Finland under the terms and conditions of importing pets, no more than 5 individuals may be imported at any one time, and the animals imported must travel with their owner (or the owner's representative); also, the animals must not be intended for sale or for transfer to a new owner. Unless all of these conditions are fulfilled,

the animals must comply with the requirements for commercial imports and must be imported through a veterinary border inspection, which is subject to a fee.

Live animals to be imported must fulfil not only the aforementioned inspection requirements but also the animal health requirements specified in Decree 866/2008 of the Ministry of Agriculture and Forestry (species-specific requirements including countries from which imports are allowed, recommended vaccinations and tests, veterinary certificates required, etc.). Notwithstanding the above, terms and conditions for the health of recreational and pet birds are provided for in Decree 867/2008 of the Ministry of Agriculture and Forestry.

Water Act (264/1961)

Water areas and waters

Section 15 (88/2000)

Unless otherwise prescribed in the provisions below or in a permit issued under said provisions, no water may be led from a water body, and no measures taken in the water body or on land, if such measures may lead to a change in the position, depth, water level or flow of the water body and thereby

- 1) cause damage or harm to someone else's water area, fishing, land, buildings or other property,
- 2) cause a flood risk, general shortage of water or harmful changes in the aquatic environment and its functions,
- 3) markedly reduce natural beauty, environmental amenity, cultural values or the usability of the water body as a water supply or its use for recreational purposes,
- 4) reduce the self-purification capacity of the water body or alter the main channel or hinder the use of a public channel for transport or floating,
- 5) cause a health hazard, or
- 6) infringe the public interest in some other way comparable to those mentioned above (prohibition on altering a water system).

The prohibition referred to above in subsection 1 shall also apply, as applicable, to the operation of a structure or a device.

The prohibition referred to above in subsection 1 shall also apply to any measure which may lead to a

change in the water quality or in the bottom of the water body, causing the consequences referred to in said subsection, unless the measure is one referred to in section 3(1) paragraph 1 of the Nature Conservation Act (86/2000) or in section 19 of this chapter.

The prohibition referred to above in subsection 1 shall not, however, apply to a measure that can only cause damage or harm to a private individual, if he has given his consent to said measure.

Section 30

Anyone who suffers from sludge, shallows or a similar hindrance which restricts the use of a water body shall be entitled, without permission and even in someone else's water area, to take the necessary action to remove the hindrance so as to improve the condition and usability of the water body, provided this does not result in a change or consequence referred to in sections 12 to 15 or section 19 of this chapter, or performance of the work does not cause substantial harm to the owner of the water area. If the measure taken is not of minor significance, the owner of the water area or, if the water area is jointly owned, the joint owners of the water area as specified in section 26 of the Act on Jointly Owned Areas and, as provided by decree, the Centre for Economic Development, Transport and the Environment or municipal environmental protection authority shall be notified in advance that work is commencing and of the measures that will be taken. (1391/2009).

The provisions on chapter 4 section 6 on dredged spoils shall apply as appropriate to material removed from the bottom of a water bod. (467/1987)

Any damage caused by a measure referred to above in this section must be compensated.

Environmental Protection Act (86/2000)

Section 12 (253/2010)

Certain activities

More detailed provisions to prevent the risk of environmental contamination may be issued by Government Decree concerning the following sectors and activities:

9) fish farming,

The provisions referred to above in subsection 1 may apply to the following, in addition to what is provided for in section 11:

1) limitation of discharges into the environment and of their direct and indirect harmful impacts,

2) environmental protection limitations on the placement of activities, requirements for the placement of activities in various areas, and minimum distances from sites threatened by exposure,

3) methods, devices, buildings and structures to be employed to prevent discharges or their spreading, or to prevent accidents or risk of same, and to secure energy efficiency,

4) the scope and operating hours of operations,

5) the disposal and management of waste,

6) monitoring and the operator's obligation to disclose information to the authorities,

7) measures to be taken after operations cease, and

8) any other measures to be taken to comply with the requirements of sections 41–43, 45 and 46.

The Government Decree referred to above in subsection 1 may also provide for the period within which an operator who has a valid environmental permit for an activity referred to in the Decree at the time when the Decree enters into force must comply with the requirements of the new Decree.

Section 25 (1590/2009)

Monitoring the state of the environment

A local authority shall see to the necessary monitoring of the state of the environment within its municipality. The Centres for Economic Development, Transport and the Environment shall see to the monitoring of the state of the environment within their respective regions. The duties of the Finnish Environment Institute with regard to monitoring the state of the environment shall be provided for separately.

Monitoring data shall be made public and publicised as comprehensively as necessary.

Section 27 (253/2010)

Environmental protection information system

The Centres for Economic Development, Transport and the Environment and the Finnish Environment Institute shall maintain an environmental protection information system containing the necessary data on:

1) decisions made by environmental permit authorities and supervisory authorities under this Act,

- 2) activities subject to registration pursuant to this Act,
- 3) reports and monitoring concerning permits and notifications,
- 4) significant data entered in the waste database referred to in the Waste Act,
- 5) monitoring and reporting on the state of the environment related to the enforcement of this Act,
- 6) chemicals used in activities posing a threat of environmental pollution, the emissions and waste generated and the waste received, and
- 7) any other factors necessary for the enforcement of this Act.

The Centres for Economic Development, Transport and the Environment and municipal environmental protection authorities shall be responsible for ensuring that the notifications made to them of activities referred to in section 65 are entered into the aforementioned information system.

Notwithstanding the confidentiality provisions laid down in the Act on the Publicity of Actions Undertaken by Authorities (621/1999), local authorities shall submit the data referred to in subsection 1 to the environmental protection information system. Notwithstanding confidentiality provisions, municipal environmental protection authorities are entitled without charge to receive any information from the information system that is necessary for supervision and monitoring.

The provisions of the Act on the Publicity of Actions Undertaken by Authorities apply to the confidentiality and disclosure of personal data entered in the information system, and the provisions of the Personal Data Act (523/1999) apply to other handling of personal data. Personal data entered in the system shall be retained for five years after the activity ceases.

Act on Water Resources Management (1299/2004)

Section 5 (1593/2009)

Duties of Centres for Economic Development, Transport and the Environment

In each water resources management region, the duties of the Centres for Economic Development,

Transport and the Environment shall include:

- 1) drawing up an account of the characteristics of the waters,
- 2) drawing up accounts of the effects of human activity on the waters,
- 3) compiling economic analyses of water use,
- 4) collecting information on areas to be protected under Community legislation which are prescribed by Government Decree,
- 5) collecting the necessary information on areas designated for household water abstraction,
- 6) preparing a classification of water status,
- 7) organising water monitoring and drawing up a water monitoring programme,
- 8) preparing a water resources management plan and a programme of measures, and
- 9) managing other duties designated by the Ministry of the Environment and the Ministry of Agriculture and Forestry for water resources management purposes.

The Finnish Environment Institute shall provide expert assistance to the Centres for Economic Development, Transport and the Environment and maintain a register of the information referred to in subsection 1 paragraph 4.

APPENDIX II Invasive alien species portal alert functions and operating responsibilities, with recommendations regarding the information content and functions of the portal (see measure 4 in the Strategy)

Invasive alien species notifications and alerts

– Alert function of the invasive alien species portal

Notifications and alerts concerning invasive alien species are received from both Finland and the EU through the EU early warning system. Therefore, a system is needed to forward the information received. This system will enable notification to be made of an alien species that has become invasive. The system can also be set up to issue a notification automatically when an invasive alien species enters a new area.

In the system, a user can specify an advance request for notifications on particular species and particular pre-defined areas. For example, a person in Uusimaa could enter a request for any subsequent notifications of occurrences of hogweeds in Uusimaa. Similarly, parties interested in particular groups of organisms could enter a request for notifications on particular species or species groups.

The invasive alien species portal must be linked to the international EU alert function. National contact persons will receive the alerts from the EU and transfer the necessary information to the portal to make it publicly available. Species alerts from the EU (concerning species on the alert list) can be automatically forwarded to various target groups by e-mail or text messages once the relevant responsibilities (recipient lists) have been sorted out.

Invasive alien species alerts

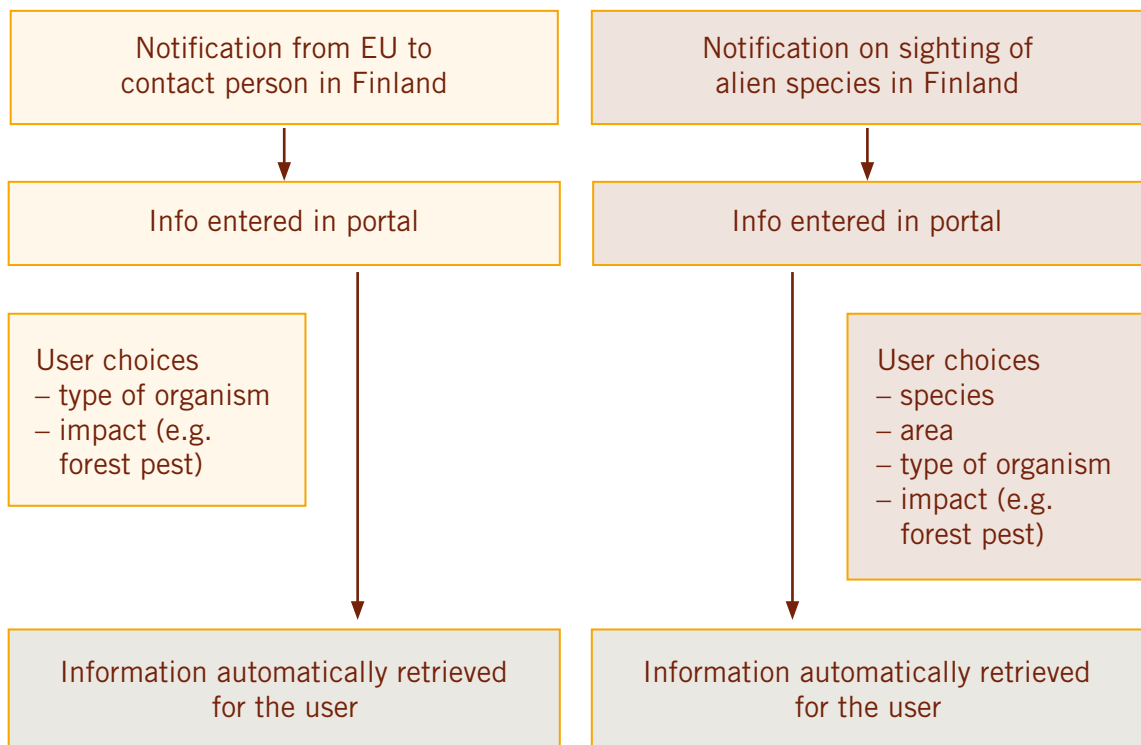


Figure 5: Invasive alien species alert function through the invasive alien species portal.

Possible alert-related operating responsibilities

The **invasive alien species portal supervisor** will be placed, for example, in the **Finnish Environment Institute**.

The portal supervisor will forward alerts, which will be processed by the relevant authority.

The initiation and implementation of any risk assessment required on the basis of the alert will be co-ordinated and governed by the **Invasive Alien Species Body**. **Experts** will be responsible for species identification and situation reports.

In case of an alert, the **authority designated by law** will launch and implement combating measures. The **Invasive Alien Species Body** may also initiate combating measures on the basis of monitoring data.

Publicity will be co-ordinated by the Invasive Alien Species Body. The Body will also govern the appropriate implementation of action taken.

Recommendations for the information content of the invasive alien species portal

Fact sheets on individual species

Information on prevention and combating of invasive alien species

General information on the number of alien species in Finland and their occurrence

General information on the impacts of alien species

General information on how alien species spread

Links to websites on invasive alien species

References to literature on invasive alien species

Legislation and agreements concerning invasive alien species

News on invasive alien species, national and international

Alien species events

Alien species sightings

Invasive alien species alerts

Instructions for conducting a local campaign against invasive alien species

Information on ongoing invasive alien species projects

Identifying marks for individual species

Impacts of individual species

Combating measures against individual species

Contact information of parties responsible for action against invasive alien species

Images of invasive alien species

Advice on restricting the spreading of invasive alien species for various actors (gardeners, fishermen, etc.)

List of invasive alien species

Recommendations for portal functions

Fact sheets for individual species must be automatically generated from the database

Retrieval of fact sheets for individual species

Entering observation data into the portal

Notification of observation online

Functions for mass transfer of observation data

Printouts from the portal (tables and maps)

Setting search criteria

User registration as authorised official or private citizen

Information on invasive alien species projects to be entered in the portal

Automatic retrieval of information on invasive alien species projects to user submitting notification of observation

E-mail alert

Volunteers may submit their contact information for combating campaigns

The invasive alien species portal will collect observation data on alien species in Finland, which are currently spread out among a variety of sources. Information sources include databases, species inventories and literature. It should be possible to collect all observations of invasive alien species made by various actors (scientists, officials, local authorities, NGOs and private citizens) in one place, in an invasive alien species database freely available to all users. The Centres for Economic Development, Transport and the Environment should be required to notify the portal keepers of sightings of invasive alien species and to ensure species identification locally, etc.

APPENDIX III Alien species risk assessment: Concepts and stages in risk assessment; terminology

Concepts and stages in risk assessment

a) Identify the hazard

At this stage, it is observed that a hazard (e.g. a pathogen or an invasive alien species) is associated with a specific activity. For instance, importing timber from a country where a particular plant pest occurs may cause the entry into Finland of that plant pest (a plant pest that may be present in the timber is a hazard). The hazard may be identified for instance by the client commissioning the risk assessment.

b) Describe the hazard

This stage involves describing the characteristics of the hazardous organism, e.g. its life cycle, pathways or target populations where it may end up. In the aforementioned example, this involves finding out where imported timber is brought and what it is used for, how the wood is treated and whether the hazardous organism could survive certain treatments. It must also be established whether there are any plants that the plant pest in question could destroy.

c) Estimate the exposure

This stage involves estimating the probability of the hazardous organism ending up in the target population (i.e. susceptible species living in Finland) and of it spreading in the target population. The speed and extent of spreading and the extent of the damage that would be caused must also be estimated as far as possible. At this point, the investigation may include several options for risk management; their effect on the aforementioned points must be explored.

d) Describe the risk

The probability of exposure and its effectiveness combine to produce an estimate of the risk, and this should make the risk easier to manage. In the aforementioned example, timber importers would be issued instructions on how to handle and treat the wood, or authorities would be asked to update their inspection instructions with regard to the handling of timber from a specific region. The risk management option considered the most sensible based on the risk assessment will be adopted.

National risk assessment terms in invasive alien species risk assessment:

client = the risk management authority (i.e. ministry) responsible for the risk/hazard caused by the invasive alien species or activity in question

hazard = a new alien species, a species not indigenous in Finland's natural environment; a species that does not belong in Finland and enters Finland as the result of human action

risk = the chance of a new alien species entering Finland and breeding here; or the chance of the harmful impacts of an invasive alien species already occurring in Finland becoming worse

identifying a hazard = a hazard is identified usually based on an activity or a phenomenon (or new information on a known activity/phenomenon) that could translate a hazard into a risk

describing a hazard = the characteristics, environmental requirements, breeding rate and habits, growth environment and environment conducive to spreading of a hazardous organism

estimating exposure = an estimate of the probability of the hazardous organism entering the country and means for influencing the risk of entry; this also involves establishing the potential for the species for surviving, breeding and spreading in Finland. The spreading rate and extent of the species must be estimated and means proposed to prevent spreading if necessary.

The consequential impacts of the entry and proliferation of an invasive alien species to Finland's indigenous species, agriculture and forestry, game management and fisheries, transport, social infrastructures and recreational activities must also be estimated.

describing a risk = an overall conception of a risk and the factors affecting it, which can then be measured against various risk management options, is obtained by considering the probability of the hazard, risk and exposure, the rate of spreading of the invasive alien species and the magnitude of its indirect impacts.

APPENDIX IIIa Risk assessment procedure: Description of measure 6.1

Risk classification of alien species

A three-stage risk classification system for alien species should be developed in Finland.

Stage 1: Evaluative screening of species

The purpose of evaluative screening is to limit the group of species being considered to those that are the most likely to enter Finland and to focus available resources on those, though without forgetting other potential invasive alien species that could cause great damage. Out of all the species in the world, those most likely to enter Finland will be identified.

Purpose of the screening: To find out which species should be considered in the analysis in the first place.

Carried out by: Invasive alien species experts and Invasive Alien Species Body. The assessment will be based on various systems (Early Warning, Europhyt, EPPO), taking into account species identified in Finland's National Strategy on Invasive Alien Species, the information in the invasive alien species portal and information in the LYNET* network of experts.

Costs of the stage: Costs of the expert contributions.

This task belongs to the Invasive Alien Species Body.

TASK 1: Assign the evaluative screening of species to the Invasive Alien Species Body. Link the evaluative screening to the early warning system.

Targets: To limit the domain of species considered to the most relevant species.

Stage 2: Prioritisation of species on the basis of the prioritisation model developed for Finland

The prioritisation model developed for Finland enables the identification in the list produced through evaluative screening of those species that constitute the greatest risks for the environment, the economy and public health in Finland. Prioritisation has the following benefits: 1) correct and efficient allocation of resources, 2) transparent grounds for decision-making, 3) analysis of the problem and related issues, and 4) supporting the decision-making process in cases of conflict (e.g. a species which is beneficial for an individual actor or group of actors but ecologically disastrous).

Target: To rank invasive alien species based on the risks they cause.

Client of this stage: Invasive Alien Species Body, based on the evaluative screening.

Carried out by: The application of the point score model will be the responsibility of one member or all members of the risk assessment network (see the next section). It will not be necessary for the Risk Assessment Research Unit (see the next section) to participate in the ranking, but they must be familiar with the prioritisation model used.

TASK 2: Develop a prioritisation model for Finland using which individual species can be ranked according to the magnitude of the risk(s) they cause.

Targets: To develop prioritisation models for ranking different types of invasive alien species, suitable for Finland and sufficiently reliable, as compatible as possible with models used internationally, and sufficiently simple to be used independently in the LYNET organisation.

Parties responsible: Finnish Food Safety Authority Evira, LYNET institutions

Resources: 2 person-years. Project funding.

TASK 3: Prioritise the species selected in Stage 1 using the prioritisation model.

Targets: Establish which species constitute the greatest risk for the environment, the economy and public health in Finland. The resulting list can be used to allocate existing resources to where they are of the greatest benefit to society. The use of resources will be transparent and based on consistent criteria. A risk assessment can be carried out on the highest-risk species at stage 3.

Resources: Project funding for the initial evaluations. After that, about 0.1 to 0.2 person-months per species, depending on the properties of the prioritisation model, the amount of information available and the professional skills of the evaluators.

* Research Consortium for Natural Resources and the Environment

Stage 3: Risk assessments on the highest-risk species

In order to ensure the reliability of the risk assessments conducted and their acceptability in international contexts, a risk assessment organisation must be set up in Finland to develop and maintain risk assessment expertise. The best available national experts shall be employed for individual risk assessments, and the participation of members of the LYNET network is thus essential. The risk assessment organisation will operate according to these principles:

Risk assessment network:

1. The risk assessment network will be attached to the Invasive Alien Species Body.
2. The risk assessment network will consist of representatives appointed by LYNET research institutions and other experts as required.
3. The risk assessment network contributes to risk assessments commissioned by the Invasive Alien Species Body or other parties as agreed.
4. Members of the risk assessment network will be paid a separate compensation for their contribution on the basis of work done, or their participation will be paid for through project funding.

Risk Assessment Research Unit:

5. Responsibility for the management and co-ordination and partly of implementation of invasive alien species risk assessments rests with the Risk Assessment Research Unit of the Finnish Food Safety Authority Evira.
6. The Risk Assessment Research Unit will call on the assistance of a group of experts from the risk assessment network.
7. The Risk Assessment Research Unit will conduct risk assessments by agreement, pursuant to a performance agreement or service agreement, or on separate risk assessment or project funding.

The statutory duty of the Finnish Food Safety Authority Evira is to conduct risk assessments and engage in scientific research in the areas of the safety and quality of foods and of agriculture and forestry production inputs, of animal health and welfare, and of plant health. It is not feasible to transfer these responsibilities to any other body in the context of invasive alien species risk assessments.

The Risk Assessment Research Unit at Evira should be provided with two additional person-years in resourcing to bring in risk assessment expertise in the areas of invasive alien species and plant health. It must be ensured when commissioning risk assessments that the overall work load per employee at the Unit is not substantially increased. This can be ensured by limiting the number of risk assessments commissioned per year and by co-ordinating other work commissioned from the Unit in order to limit the overall number of commissions. If, however, the work load of the Unit exceeds the level agreed, further resources must be allocated to assessments.

This arrangement will ensure that Finland has a sufficient critical mass of risk assessment expertise at a single unit for further accumulation of high-quality risk assessment expertise. The arrangement will also ensure that the risk assessments conducted are consistent and of high quality.

Risk assessments which have or can be assumed to have impacts on trade must be conducted pursuant to the risk assessment standards of the IPPC, the OIE and the Codex Alimentarius, as approved in the SPS Agreement of the WTO. Risk assessments on marine species shall comply with the instructions of the IMO, HELCOM and OSPAR as relevant. In all other cases, risk assessments shall be conducted pursuant to internationally accepted best practices.

TASK 4: Develop the Risk Assessment Research Unit at Evira as a risk assessment expert body.

Target: To achieve a centre of expertise for risk assessment in various species groups to conduct the commissioned risk assessments at a high level of quality, consistently and cost-effectively.

Resources: 2 person-years per year, allocated to the Risk Assessment Research Unit at Evira.

TASK 5: Compile a list of experts on points to be considered in risk assessment for later use.

Target: To achieve a network of experts (on species and species groups, impacts, pathways, etc.) to leverage in risk assessments to ensure the use of the best available expertise. The expert network will also be required for other proposed measures such as the early warning system.

Resources: Low.

The duties of the risk assessment organisation include conducting risk assessments of the following kind, as commissioned:

1. Risk assessment on species already occurring in Finland

Conducting risk assessments on the most harmful invasive alien species already occurring in Finland is essential so that available resources can be efficiently targeted at the appropriate species and the appropriate control methods.

Risk assessment targets:

- to find out the size of the population already established in Finland and expected changes thereto,
- to find out the environmental, economic and health impacts of the population already established in Finland, and
- to find out the most appropriate combating measures for the population (eradication, limitation, control, adaptation).

Risk assessment client: Invasive Alien Species Body

Risk assessment producer: It is recommended but not necessary for the Risk Assessment Research Unit to participate in conducting these assessments, unless it has specific expertise concerning the species being assessed. Specific expertise on species, impact assessment expertise and combating measures assessment expertise will be acquired from LYNET research institutions and other actors.

Risk assessment costs: About 1 to 24 person-months per species, depending on the extent of the risk assessment and the amount of information available.

2. Risk assessments on species not occurring in Finland but susceptible to unintentional introduction

Conducting risk assessments on invasive alien species not occurring in Finland but susceptible to unintentional introduction is essential so that available resources can be efficiently targeted at the appropriate species and the appropriate control methods.

Risk assessment targets:

- to find out points of entry and probabilities of introduction of the species,
- to find out the probability and extent of establishment and spreading of the species,
- to find out the probable environmental, economic and health impacts of the species being introduced to the country, becoming established and spreading,
- to find out which means may be employed to reduce the probability of introduction and their costs and effectiveness, and
- to find out the most feasible combating measures and procedures to employ if the species is detected in the country.

Risk assessment client: Ministry of Agriculture and Forestry, Ministry of the Environment or Invasive Alien Species Body

Risk assessment producer: It is essential for the Risk Assessment Research Unit to participate in these assessments. Specific expertise on species, establishment assessment expertise, impact assessment expertise and combating measures assessment expertise will be acquired from LYNET research institutions and other actors.

Risk assessment costs: About 12 to 36 person-months per species, depending on the extent of the risk assessment and the amount of information available.

3. Risk assessments on species not occurring in Finland but subject to intentional translocation

Conducting risk assessments on alien species not occurring in Finland but subject to intentional translocation is essential to assess whether the benefits to society of the importing of such species are greater than the potential harmful impacts of same. The assessments will also yield information on what would be the most effective control measures in the event that such a species manages to escape into the wild in Finland.

Risk assessment targets:

- to find out the probability and extent of establishment and spreading of the species,
- to find out the probable environmental, economic and health impacts of the species becoming established and spreading,
- to find out the most feasible combating measures and procedures to employ if the species escapes into the wild.

Risk assessment client: Ministry of Agriculture and Forestry, Ministry of the Environment, party proposing the importing of the species (at its own cost).

Risk assessment producer: It is essential for the Risk Assessment Research Unit to participate in these assessments. Specific expertise on species, establishment assessment expertise, impact assessment expertise and combating measures assessment expertise will be acquired from LYNET research institutions and other actors.

Risk assessment costs: About 6–36 person-months, species, depending on the extent of the risk assessment and available information.

The duties of the risk assessment organisation include conducting risk assessments of the following kind, as commissioned:

4. Special risk assessments

Special risk assessments may be commissioned to find out the risk to society not of an individual species but of an individual function. On the basis of the risk assessment, measures for efficiently reducing such a risk to society can be mandated or recommended for that function.

Special risk assessments may address for instance:

- comprehensive risk assessment on any individual pathway (e.g. wood chips, planting seeds, ballast water, wood packaging material),
- risk assessments on individual companies or types of companies (e.g. seedling orchards, pet shops, shipping lines),
- assessment of control measures to explore the costs and benefits of each, or
- risk assessments related to the Ballast Water Convention.

Risk assessment client: The administrative sector or ministry responsible for risk assessment or likely to suffer from the risk; any other party (at its own cost).

Risk assessment producer: In most cases it is essential for the Risk Assessment Research Unit to participate in these assessments. Other expertise will be obtained from LYNET research institutions and other actors.

Risk assessment costs: About 0.1 to 36 person-months per species, depending on the extent and purpose of the risk assessment and the amount of information available.

New and transferred resources for risk assessment measures

Measure	New resources	Transferred resources	Note
Evaluative screening	x	x	Mainly involves leveraging existing knowledge, but some combining of information is required and hence some new resources.
Prioritisation model development and initial prioritisation		x	If implemented as a research project on project funding.
Application of the prioritisation model after the initial stage	x		Estimated at 0.1 to 0.2 person-months per species.
Strengthening the Risk Assessment Research Unit at Evira with invasive alien species expertise and plant expertise	x		2 person-years per year.
Risk assessments	x	x	New resources if conducted on dedicated funding. May be transferred resources if e.g. project funding is used. In some cases, a risk assessment may be commissioned and paid for by a private party.

APPENDIX IV Working group and experts who prepared the proposal Strategy

Working group preparing the proposal Strategy:

Chairman: Veikko Marttila, Environment Director, Ministry of Agriculture and Forestry
Deputy chairman: Esko Jaakkola, Environment Counsellor, Ministry of the Environment

Regular members and personal deputy members of the working group:

Sini Wallenius, Senior Advisor (Agriculture), Ministry of Agriculture and Forestry
Marjukka Mähönen, Ministerial Adviser, Ministry of Agriculture and Forestry
Tuula Mäki-Valkama, Senior Specialist, Ministry of Agriculture and Forestry
Jouni Tammi, Senior Officer, Ministry of Agriculture and Forestry
Saara Jääskeläinen, Ministerial Adviser, Ministry of Transport and Communications
Lolan Eriksson, Ministerial Counsellor, Ministry of Transport and Communications
Matti Osara, Senior Officer, Ministry of the Environment
Penina Blankett, Senior Officer, Ministry of the Environment
Hanna Ranta, Researcher, Finnish Food Safety Authority Evira
Sami Markkanen, Senior Officer, Finnish Food Safety Authority Evira
Terho Hyvönen, Principal Research Scientist, MTT Agrifood Research Finland
Jaakko Heikkilä, Senior Research Scientist, MTT Agrifood Research Finland
Antti Pouttu, Researcher, Finnish Forest Research Institute
Arja Lilja, Researcher, Finnish Forest Research Institute
Vesa Ruusila, Research Director, Finnish Game and Fisheries Research Institute
Markku Pursiainen, Programme Director, Finnish Game and Fisheries Research Institute
Harry Helmisaari, Senior Officer, Finnish Environment Institute
Terhi Rytteri, Senior Research Scientist, Finnish Environment Institute
Maiju Lehtiniemi, Research Specialist, Finnish Environment Institute
Juha Flinkman, Research Specialist, Finnish Environment Institute
Pirjo Mäkelä, Professor, University of Helsinki (deputy member as of 7 January 2011)
Kari Heliövaara, Professor, University of Helsinki (regular member as of 7 January 2011)
Markus Helavuori, Maritime Inspector, Finnish Transport Safety Agency
Päivi Yrjönen, Head of International Affairs, Finnish Transport Safety Agency
Mika Virtanen, Secretary for Cereals, Central Union of Agricultural Producers and Forest Owners (MTK)
Lea Jylhä, Forestry Specialist, Central Union of Agricultural Producers and Forest Owners (MTK)
Jari Särkkä, Nursery Farmer, Central Organisation for Finnish Horticulture
Jyri Uimonen, Special Consultant, Central Organisation for Finnish Horticulture
Tapani Veistola, Nature Conservation Expert, Finnish Association for Nature Conservation
Hannele Ahponen, Water Expert, Finnish Association for Nature Conservation
Pirjo Nykänen, Senior Customs Inspector, Finnish Customs
Anssi Kartila, Senior Inspector, Finnish Customs (until 10 September 2009);
Heli Lampela, Senior Customs Inspector, Finnish Customs (as of 10 September 2009)

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Permanent expert members:

Marianne Kettunen, Senior Policy Analyst, Institute for European Environmental Policy (IEEP)
Petri Nummi, Docent, University of Helsinki
Anu Pärnänen-Landtman, Counsellor, Ministry for Foreign Affairs
Leif Schulman, Director, Finnish Museum of Natural History (University of Helsinki)

Working group secretaries:

Johanna Niemivuo-Lahti, Senior Adviser (Environment), Ministry of Agriculture and Forestry
Jaana Kaipainen, Senior Adviser (Environment), Ministry of Agriculture and Forestry

Other invited experts:

Mikael Hildén, Professor, Finnish Environment Institute
Seppo Hellsten, Professor, Finnish Environment Institute
Pirjo Isotupa, M.A., Finnish Association for Nature Conservation

APPENDIX V Experts heard during the preparation of the Strategy, and experts in sub-groups contributing to the preparation of the Strategy

Experts heard during the preparation of the Strategy

Ari-Pekka Auvinen (Finnish Environment Institute)
Visa Eronen (Uusimaa Game Management District)
Jaakko Heikkilä (MTT Agrifood Research Finland)
Risto Heikkinen (Finnish Environment Institute)
Kari Heliövaara (University of Helsinki)
Timo Hokkanen (North Karelia Centre for Economic Development, Transport and the Environment)
Eija Kirjavainen (Ministry of Agriculture and Forestry)
Heikki Korpelainen (Ministry of the Environment)
Jussi Laanikari (Ministry of Agriculture and Forestry)
Juha Pöyry (Finnish Environment Institute)
Antti Rautiainen (Stara, City of Helsinki)
Kari Saikkonen (MTT Agrifood Research Finland)
Lauri Urho (Finnish Game and Fisheries Research Institute)
Ilmari Valovirta (Finnish Museum of Natural History / University of Helsinki)

Experts in sub-groups contributing to the preparation of the Strategy:

Baltic Sea sub-group

Penina Blankett (Ministry of the Environment)
Jaakko Heikkilä (MTT Agrifood Research Finland)
Markus Helavuori (Finnish Transport Safety Agency), sub-group leader
Tarja Katajisto (Finnish Environment Institute)
Ari Laine (Metsähallitus)
Maiju Lehtiniemi (Finnish Environment Institute), sub-group leader
Erkki Leppäkoski (Åbo Akademi University)
Elina Leskinen (University of Helsinki)
Reetta Ljungberg (HELCOM)
Anita Mäkinen (Finnish Transport Safety Agency)
Jari-Pekka Pääkkönen (Environment Centre, City of Helsinki)
Lotta Ruokanen (Environment Centre, City of Helsinki)
Lauri Urho (Finnish Game and Fisheries Research Institute)
Pia Vennerström (Finnish Food Safety Authority Evira)
Pentti Välipakka (Southeast Finland Centre for Economic Development, Transport and the Environment)

Inland waterways sub-group

Hannele Ahponen (Finnish Association for Nature Conservation)
Anna Eriksson-Kallio (Finnish Food Safety Authority Evira)
Seppo Hellsten (Finnish Environment Institute), sub-group leader
Harry Helmissaari (Finnish Environment Institute)
Tea Huotari (University of Helsinki)
Heikki Hämäläinen (University of Jyväskylä)
Japo Jussila (Crayfish Information Centre)
Kari Kilpinen (Federation of Finnish Fisheries Associations)
Hannu Lehtonen (University of Helsinki)
Hannu Luotonen (North Karelia Environment Centre)
Timo Muotka (University of Oulu)
Markku Pursiainen (Finnish Game and Fisheries Research Institute), sub-group leader
Jouni Tammi (Ministry of Agriculture and Forestry)
Pia Vennerström (Finnish Food Safety Authority Evira)
Paula Henttonen (University of Eastern Finland), expert evaluation, epibionts
Jouni Tulonen (Finnish Game and Fisheries Research Institute), expert evaluation, eel swim bladder nematode
Satu Viljamaa-Dirks (Finnish Food Safety Authority Evira), expert evaluation, crayfish plague

Alien land vertebrate species sub-group

Jouko Högmander (Metsähallitus)
Kaarina Kauhala (Finnish Game and Fisheries Research Institute)
Maija Lahti (Finnish Fur Breeders' Association)

Teemu Lehtiniemi (BirdLife Finland)
 Petri Nummi (University of Helsinki), sub-group leader
 Antti Oksanen (Finnish Food Safety Authority Evira)
 Matti Osara (Ministry of the Environment)
 Vesa Ruusila (Finnish Game and Fisheries Research Institute), sub-group leader
 Marko Svensberg (Hunters' Central Organisation)
 Tapani Veistola (Finnish Association for Nature Conservation)
 Helinä Ylisirniö (Finnish Federation for Animal Welfare Associations)

Alien plant species sub-group

Aulis Ansalehto (ProAgria)
 Timo Hokkanen (North Karelia Centre for Economic Development, Transport and the Environment)
 Tiina Kanerva (Metsähallitus)
 Paula Lilja (Finnish Food Safety Authority Evira)
 Raija Merivirta (Finnish Transport Agency)
 Jouko Rikkinen (University of Helsinki)
 Terhi Rytteri (Finnish Environment Institute), sub-group leader
 Leif Schulman (Finnish Museum of Natural History)
 Jari Särkkä (Central Organisation for Finnish Horticulture)
 Satu Tegel (City of Helsinki)
 Olli Turunen / Markus Seppälä (Finnish Association for Nature Conservation)
 Jyri Uimonen (Central Organisation for Finnish Horticulture)
 Henry Väre (Finnish Museum of Natural History)
 Sini Wallenius (Ministry of Agriculture and Forestry)

Alien species in agriculture and forestry sub-group

Asko Hannukkala (MTT Agrifood Research Finland)
 Salla Hannunen (Finnish Food Safety Authority Evira)
 Jaakko Heikkilä (MTT Agrifood Research Finland)
 Kari Heliövaara (University of Helsinki)
 Erja Huusela-Veistola (MTT Agrifood Research Finland)
 Terho Hyvönen (MTT Agrifood Research Finland), sub-group leader
 Marja Jalli (MTT Agrifood Research Finland)
 Hannu Kukkonen (Finnish Food Safety Authority Evira)
 Pauliina Laitinen (MTT Agrifood Research Finland)
 Anne Lemmetty (MTT Agrifood Research Finland)
 Arja Lilja (Finnish Forest Research Institute)
 Paula Lilja (Finnish Food Safety Authority Evira)
 Leena Lindström (University of Jyväskylä)
 Irmeli Markkula (MTT Agrifood Research Finland)
 Päivi Parikka (MTT Agrifood Research Finland)
 Antti Pouttu (Finnish Forest Research Institute)
 Anne Nissinen (MTT Agrifood Research Finland)
 Pirjo Mäkelä (University of Helsinki)
 Tuula Mäki-Valkama (Ministry of Agriculture and Forestry)
 Hanna Ranta (Finnish Food Safety Authority Evira), sub-group leader
 Kari Saikkonen (MTT Agrifood Research Finland)
 Kari Tiilikkala (MTT Agrifood Research Finland)
 Tuomo Tuovinen (MTT Agrifood Research Finland)
 Mika Virtanen (Central Union of Agricultural Producers and Forest Owners (MTK))
 Irene Vänninen (MTT Agrifood Research Finland)
 Mirikka Soukainen (Finnish Food Safety Authority Evira), expert contribution
 Salla-Riikka Vesterlund (University of Turku), expert contribution

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Small group preparing the risk assessment draft

Jaakko Heikkilä (MTT Agrifood Research Finland)
 Harry Helmisaari (Finnish Environment Institute)
 Salla Hannunen (Finnish Food Safety Authority Evira)
 Tapani Lyytikäinen (Finnish Food Safety Authority Evira)
 Tuula Mäki-Valkama (Ministry of Agriculture and Forestry)
 Hanna Ranta (Finnish Food Safety Authority Evira)

Indoor pests small group

Kari Heliövaara (University of Helsinki)
 Pirjo Isotupa (Finnish Association for Nature Conservation)
 Hanna Ranta (Finnish Food Safety Authority Evira)

APPENDIX VI Background materials used in the preparation of the Strategy

Research projects on invasive alien species commissioned by Finland's Ministry of Agriculture and Forestry for the preparation of Finland's National Strategy on Invasive Alien Species:

- 1) Anticipating the significance of climate change in the spreading of species to Finland: Synthesis of research findings and macroclimate comparison (Risto Heikkinen, Juha Pöyry, Stefan Fronzek, Niko Leikola).
- 2) Changes in fish species and populations and non-native species as the climate changes (Lauri Urho, Zeynep Pekcan-Hekim).
- 3) Alien species in plant production risk management (Kari Saikkonen, Terho Hyvönen).
- 4) Development of alien species monitoring, an early warning system and risk assessment in our marine areas (VISEVARIS) (Lauri Urho, Maiju Lehtiniemi, Erkki Leppäkoski).
- 5) National invasive alien species portal: Design and preparation for rollout (Harry Helmisaari, Niko Leikola, Terhi Rytteri).

Other background material used in the preparation of the Strategy:

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Author(s)	Based on the proposal prepared by the working group on a National Strategy on Invasive Alien Species, edited by Johanna Niemivuo-Lahti	
Title of publication	Finland's National Strategy on Invasive Alien Species	
Abstract	<p>The objective of the National Strategy on Invasive Alien Species (IAS) is to reduce the damages and risks caused by invasive species to the Finnish nature, sustainable utilisation of natural resources and livelihoods. The aim is to take action at the earliest stage possible with a view to combat invasive alien species because this is the most effective and far less costly approach to prevent damages caused by IAS.</p> <p>According to estimates by experts, in the beginning of 2011 there were a total of 157 IAS permanently established in Finland which cause clearly identifiable, direct or indirect damage. A significant share of these species (108 species) are agricultural and forestry species. Of the remaining species 5 occur in the territorial waters of Finland in the Baltic Sea, 5 in inland waters, 6 are land vertebrates, 24 are plant species and 9 are indoor pests. In addition, about 123 species not native to Finland to be monitored or which may be locally harmful were identified. Invasive alien species defined as particularly harmful include, besides the dangerous pests called quarantine species (37 species), Japanese rose (<i>Rosa rugosa</i>), crayfish plague (<i>Aphanomyces astaci</i>), giant hogweed (<i>Heracleum mantegazzianum</i>, <i>H. persicum</i>, <i>H. sosnowskii</i>), Spanish slug (<i>Arion lusitanicus</i>) and [American] mink (<i>Mustela vison</i>).</p> <p>Action is required to reduce the harmful impacts of invasive alien species. The Action Plan of Finland's National Strategy on Invasive Alien Species puts forward 16 different types of measures. These include comprehensive legislation on IAS, establishing an expert body to monitor and promote the actions in IAS, introducing publicity and training measures concerning IAS, setting up a national IAS portal, and creating a system for early warning and monitoring of IAS. The objectives of the Action Plan also include setting up a national risk assessment system for IAS, increasing research on IAS, especially related to risk assessments, preparations to prevent the entry of IAS to Finland and to launch rapid measures against IAS already present in the country, as well as encouraging voluntary action by citizens to prevent IAS. As set out in the Action Plan, funding mechanisms for preventing IAS are developed while ensuring that IAS do not spread across borders through Finland and that Finland also participates in international action to combat IAS. In addition, a set of targeted measures are taken to prevent damage caused by IAS in the Baltic Sea and inland waters and by alien land vertebrates and land plants. One objective contained in the strategy is to completely eradicate giant hogweeds in Finland within the next 10 to 20 years.</p> <p>The Government Resolution on Finland's National Strategy on Invasive Alien Species was adopted on 15 March 2012.</p>	
Keywords	alien species, invasive alien species (IAS), potentially or locally harmful alien species, invasive alien species in the Baltic Sea, invasive alien species in inland waters, invasive alien land vertebrates, invasive alien land plants, invasive alien agricultural and forestry species, invasive alien indoor pests	
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