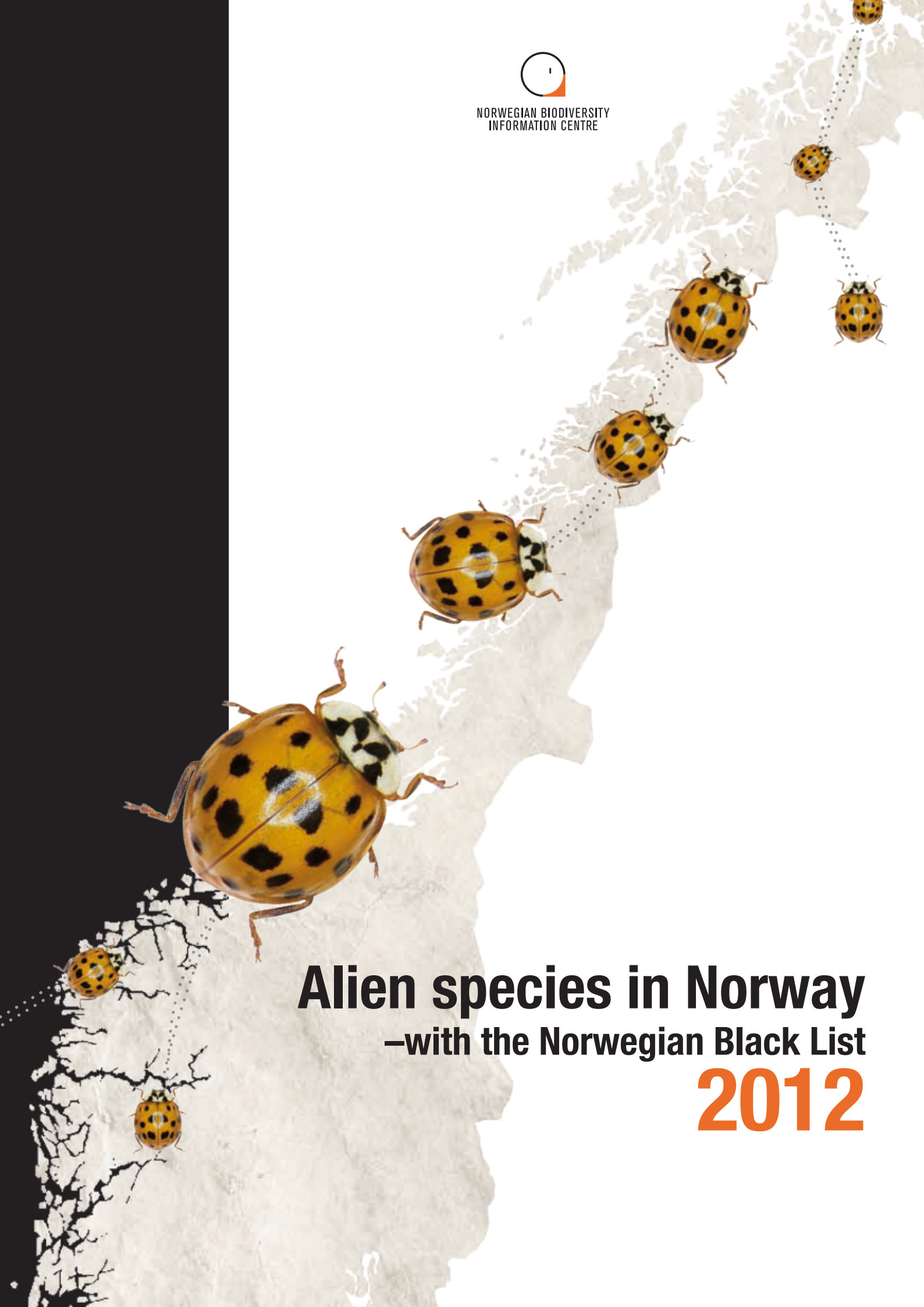
NORWEGIAN BIODIVERSITY
INFORMATION CENTRE



Alien species in Norway

–with the Norwegian Black List

2012

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Preface

The spread of alien species is considered one of the greatest global threats to biodiversity. Norwegian society as a whole has become increasingly aware of alien species and their effects. Alien species may be responsible for considerable damage to native species and habitats, and may have ecological impacts. The spread and establishment of alien species have also resulted in significant negative economic consequences around the world, along with posing threats to human health and agricultural species.

The role of the Norwegian Biodiversity Information Centre is defined in our mandate, *"The Norwegian Biodiversity Information Centre is responsible for assessing the ecological impacts associated with species that are non-native to Norway (alien species) and to provide an overview of alien species found in Norway."*

Alien species in Norway – with the Norwegian Black List 2012 thus focuses exclusively on assessments of ecological impact, and does not consider other negative consequences that may result from non-native invasive species. Tables provide an overview of the 2320 alien species that are found in Norway. Our mandate also directs us to limit our ecological risk assessment to species non-native to Norway.

It must be emphasised that the Norwegian Biodiversity Information Centre does not play any role in the management of alien species, and thus does not consider whether or not an alien species should be allowed in Norway. This is an issue that must be decided by the appropriate authorities.

Since the Norwegian Biodiversity Information Centre presented the first version of the Norwegian Black List in 2007, considerable progress has been made in developing the methods we use to assess the ecological impacts posed by alien species in Norway. Our method is based on quantitative criteria, which is a considerable improvement over the purely qualitative method we used in 2007.

Given the global scope of alien species, the need for further development of methodology is still great. We need an international process to develop a method that can be used across national boundaries. The Centre for Conservation Biology (CCB) at the Norwegian University of Science and Technology (NTNU), which helped develop our methodology in conjunction with a selection of other experts, has helped put Norway in a good position to aid in a further

Harmonia axyridis
Photo: Bjørn H. Stuedal and Geir Mogen

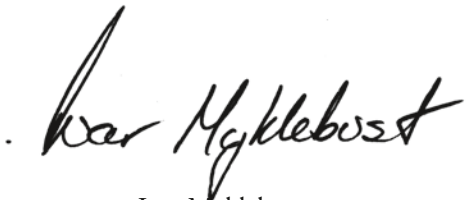
development of methodology internationally. We think that Norwegian authorities should advocate this view in relevant international forums.

Another important issue is the lack of information on alien species. This lack is the biggest limitation on our use of quantitative methods. If Norway intends to continue to develop and expand its assessments of the ecological impact posed by alien species, Norwegian authorities must increase their efforts to strengthen our knowledge base.

The Norwegian Biodiversity Information Centre hopes that *Alien species in Norway – with the Norwegian Black List 2012* can both serve as management tool as well as a source of information on alien species for relevant authorities and the public.

Finally, we would like to thank the experts who have been involved in the method development, impact assessments and writing of this document. These experts have made an invaluable contribution that has resulted in important new information and assessments of alien species.

Trondheim 12th June 2012



Ivar Myklebust
Director, Norwegian Biodiversity Information Centre

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Colpomenia peregrina
Photo: Vivian Husa

Summary

Alien species pose a serious threat to native biodiversity on a global scale. This is also true in Norway, where alien species have recently received considerable attention.

The Norwegian Biodiversity Information Centre's responsibilities with respect to alien species are outlined in our mandate: "The Norwegian Biodiversity Information Centre (NBIC) is responsible for assessing the ecological impact associated with species that are non-native to Norway (alien species) and to provide an overview of alien species found in Norway."

This work relies on the IUCN definition of alien species: "*Alien species means a species, subspecies, or lower taxon occurring outside of its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could not occupy without direct or indirect introduction or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce.*"

Alien species in Norway– with the Norwegian Black List 2012 represents a new generation of ecological impact assessments of alien species, because it is based on an entirely new set of criteria. These criteria rely on quantitative methods to estimate how likely a species is to be established and spread (the species' invasion potential) and the effect on biodiversity. The base of knowledge used to make these predictions varies depending on the survey data found for alien species in Norway or abroad.

The quantitative set of criteria have been designed to be used for all taxonomic groups and are independent of geographic region, so that it can in principle be used in other countries or other geographical areas. The set of criteria consists of nine criteria on two axes, three of which determine the species' invasion potential and six the ecological effect. The species are considered in relation to all criteria and on this basis can be placed into four subcategories on each of the axes.

Based on the highest subcategories, the species are then assigned to one of five impact categories: severe (SE), high (HI), potentially high (PH), low (LO) or no known impact (NK). The two categories which indicate the greatest impact – severe (SE) and high (HI) impact – are what form the 2012 Black List.

The Centre has used the following delimitations in its assessment of alien species in Norway, as well as for 'door knockers', which are alien species with the potential to establish in Norway: The year 1800 is used as the historical

Limax maximus
Photo: Kjetil Bevanger

time limit for risk assessments, and assessments of future risks are limited to species that have the potential to become established in the next 50 years and that could pose an ecological impact in Norway during that time. The geographical boundaries for this work are Norwegian areas in the northern hemisphere.

Nearly 50 experts from different scientific institutions have participated in preparing this assessment, which considers a total of 2595 species. These are divided into four groups:

1) 1180 species which by definition are considered alien species in Norway, including Svalbard and Norwegian territorial waters, and which reproduce or have the potential to reproduce in the wild in Norway within the next 50 years
2) 203 'door knockers', i.e. alien species that have the potential to establish themselves and reproduce in Norwegian nature
3) 1140 alien species which are recorded in Norwegian territories, but that are not thought to be able to reproduce in Norwegian nature in the next 50 years; and
4) 72 species that have been previously considered to be or have been treated as alien species, but that fall outside the delimitations of this project.

Groups that have not been treated in this categorisation are: native species that are being introduced to new areas within Norway, species that are introduced and have existing native populations, genetically modified organisms and genetic variants, subspecies or lower taxa (with the exception of vascular plants), and single-celled organisms.

Of the 2595 species considered, all 1180 alien species capable of reproducing in Norway and 134 'door knockers' have been impact assessed. Of the 1180 species, a total of 106 species are considered to have a severe impact, 111 a high impact, 198 a potentially high impact, 399 a low impact and 366 a no known impact. Seven of the 'door knockers' are assessed as having a severe impact, 23 as having a high impact, 9 as having a potentially high impact, 67 a low impact, and 28 are assessed to have no known impact.

The total number of observations of alien species in Norwegian territories has increased, with peaks in the periods 1850-1950 and from 2000 to the present. It is important to note that efforts to record these species can be quite variable, so that the timing of when a species is first observed in Norway does not necessarily correspond with its actual arrival date. Most alien species in Norway are native to Europe, followed by Asia and North America. These are areas that to some extent have similar climatic conditions as Norway.

Half of the alien species that can reproduce in Norway are present as a result of escapes or naturalising. A large proportion have arrived as stowaways, but often we do not know how the species got here, and it is assumed that the cause is human activity. Most alien species have come to Norway via unintentional introductions, and species that came as stowaways with imported plants account for more than one third of such introductions. Garden centres and nurseries are collectively the largest source of deliberate introductions of alien species into Norway.

Species used for various industrial purposes represent the largest single group of species deliberately introduced. Most of Norway's alien tree species fall into this category.

The south-eastern parts of Norway are home to the largest recorded numbers of alien species. Oslo and Akershus have the most alien species for which an impact assessment has been conducted, followed by Vestfold, Østfold and Buskerud. These are counties with generally high diversity and a favourable climate. The largest proportion of alien species are found in constructed sites, including for example residential areas, industrial areas, sand quarries, roads, and golf courses / sports fields. In addition, human influenced habitats such as meadows and pastures, arable land and woodland are habitats for a considerable proportion of alien species.

Ten of the 100 species on the International Union for the Conservation of Nature's list of the world's most invasive alien species (Lowe et al. 2000) are recorded as alien species capable of reproducing in Norway. Of these, eight species are listed in the two highest impact categories. Four of the species on the IUCN list are considered to be 'door knockers'.

The Norwegian Biodiversity Information Centre wants to establish cooperation between relevant professional specialists to further develop the methodology underlying the impact assessments. The Centre also sees that there is a need to develop an internationally agreed-upon set of criteria for the assessment of impacts posed by alien species and 'door knockers'. Another important focus is addressing the gaps in our knowledge of alien species in Norway.

Introduction

An assessment of ecological impact involves an analysis of a species actual and potential negative effect(s) upon native biodiversity. The Norwegian Black List of 2007 (Gederaas et al. 2007) was the first official overview of ecological impact assessment over alien species and the most comprehensive list over alien species in Norway. *Alien species in Norway – with the Norwegian Black List 2012* replaces the 2007 Black List with effect from 12th June 2012.

Alien species in Norway – with the Norwegian Black List 2012 has been prepared by Norwegian Biodiversity Information Centre in cooperation with a number of scientific institutions and individuals with special expertise. It is NBIC's task to assess the ecological impact associated with species that do not naturally occur in Norway (alien species), and to present a list over such species that are found in Norway. Such a task is included in NBICs mandate, as stipulated by the Ministry of Education and Research. NBIC has no management authority and therefore does not consider as to whether or not a species should be allowed in Norway. Nor does NBIC implement measures directed towards specific species.

To identify alien species that may pose a threat to native biodiversity is in itself not necessarily grounds for management priority. It is first and foremost a contribution towards background knowledge on management of biodiversity, but also improves our knowledge regarding alien species in Norway for all relevant target segments of society.

During the work on impact assessments, a new methodology and set of criteria have been employed. These are based upon quantitative assessment methods (Sæther et al. 2010, Sandvik et al. 2013). However, there is rarely enough information on species to perform direct quantitative analyses. For most species, assessments are based on insufficient information. An extensive presentation of the set of criteria used in the assessments can be found in the chapter "Methods and set of criteria".

The impact assessments carried out in 2007 were based upon qualitative assessments of the ecological effects of alien species. Probability of introduction, spreading and effect upon native species were assigned to three categories: high, unknown and low. Such qualitative assessments contain a high degree of subjectivity, and the assessments are not repeatable (Sæther et al. 2010). The new assessments presented in this document cannot be compared directly with those from 2007, but belong to a new generation of ecological impact assessments of alien species in Norway.

Neovison vison
Photo: Morten Ekker

New methods and new set of criteria

There are many international and regional conventions (agreements) relating to alien species, and also a number of trade regulations. The following two documents provide a good overview: Norwegian Strategy on Invasive Alien Species (Ministry of the Environment et al. 2007, in Norwegian) and the Nature Diversity Act (Ministry of the Environment 2009). Despite the fact that society has directed much focus towards problems related to alien species, and that they are considered to be one of the biggest threats towards biodiversity on the planet (Chapin et al. 2000), there is at present no international standardised methodology for assessing ecological impact. Several countries have carried out impact assessments for alien species, but they have used different methods and there is a large variation in the methodological approaches (Sæther et al. 2010, Sandvik et al. 2013). Due to the non-existence of a unified international set of criteria and methodology for assessing ecological impact from alien species, the processes behind this current product have been pioneering work which has been both challenging and time-consuming. With good help from central experts we feel at least that the newly developed methodology has the potential to become an important contribution to impact assessments for alien species, also in an international context.

Collation of information

In many cases there is little information on an alien species population´s biological capabilities and the impact on native species in Norwegian areas. As a result, it may be extra challenging to carry out impact assessments. It is therefore important to present the assumptions used as a basis for such assessments (Sæther et al. 2010). A collation of information on alien species is also an important tool to reveal gaps in knowledge, both regarding a species' history, invasion potential (establishment and spread) and factors influencing the species' ecological effect. During preparation of *Alien*

Box 1

Definition of the term «Norwegian nature»

Norwegian nature is a commonly used term which basically covers all nature in Norway. During work on assessing the ecological impact of alien species, the experts have had some guidelines as to which parts of the nature are included in this assessment. This is because the impact assessments should be based entirely upon the ecological impact and should not deal with the effects of humans and our activities.

Areas that are not included in this context include those which are used specifically for food production or other business ventures such as grain fields, vegetable fields, orchards and coniferous plantations. As an example, cultivated plants are omitted from this assessment, even though they are imported species, as long as they remain within the confines of the cultivated area. The grain species *Hordeum vulgare* is thus not an alien species in Norwegian nature when growing on fields, but is alien when growing along a roadside.

Photo: Rune Halvorsen

Species that are not included as part of Norwegian nature according to this definition have therefore not been subjected to an assessment process, even though they are species introduced to Norway. Cultivated species that have not spread outside the cultivated area are included in the groups *'Door knockers'* and *Species outside the project definition*.

Apart from the delimitations mentioned above, the experts have employed the flexibility within the classification system *Nature types in Norway* (NIN) by Halvorsen et al. (2009).

Box 2

Time perspective

Alien species which are assessed include species which have arrived in the country after the year 1800 A.D. This time-delimitation has been adopted as the overview of biodiversity in Norway before 1800 is largely lacking. Since then, available data have improved due to an increasing interest in natural sciences.

As a consequence of this time delimitation, the impact of some alien species has not been assessed because they were introduced prior to 1800. *Cyprinus carpio* was probably introduced already in the 17th century (Kleiven 2007), but is not included in the impact assessments and is placed in the group of species not dealt with by this project. During the past 250 years, attempts have been made to introduce *Cyprinus carpio* to at least 35 localities, but the species survival is largely limited by climate and the species scarcely has any great potential for spreading in Norway.

Even so, there are a few species with established populations in Norway from before 1800 whose impact have been assessed and are considered here as alien species. Examples of such are *Sus scrofa* and *Ovibos moschatus*. These are species which lived in Norway in prehistoric times and have subsequently been reintroduced at a much later point in time.

Photo: Rainer Erl

Sus scrofa was originally found in deciduous forests along the coast of Norway and probably died out as a result of human alteration of this habitat, from hunting and from hybridising with domesticated pigs (Rosvold et al. 2010). The species has been absent from our fauna since the last interglacial period (Bevanger 2005). Today's population of *Sus scrofa* arrived in Norway in the 1990s after spreading from populations of introduced animals in Sweden (secondary introduction). *Sus scrofa* disappeared from Sweden in the 17th century as a result of hunting, but has since been introduced on a number of occasions as a quarry species and as a farm animal (Lemel & Truvé 2008). Since the 1980s wild populations have become established from escaped individuals, and in 1988 the Swedish Parliament decided that the species be considered as native and a part of the Swedish fauna.

species in Norway – with the Norwegian Black List 2012 special effort has been made towards gathering as much information as possible about each species. This applies mainly to: who are they, when did they come, where do they come from, how have they reach the country (vectors), how often, what is their reproductive capacity, which habitat do they prefer (both at present as well as predicted in the future), and what data exists on the species' history of expansion (both within Norway as well as abroad). In many cases some of this information is lacking, and such uncertainties will be revealed in information about those species.

Availability of data

The professional assessments upon which this product is based were carried out by eleven groups of experts chosen by NBIC in 2011. NBIC has created a database where the assessments have been entered. This allows standardisation of use of criteria as best as possible, and also documents the background for the assessments and the conclusions. Impact assessments and information relating to the species' habitat, dispersal history, and important vectors are available on NBICs web-site (www.biodiversity.no). The web-site presents a more detailed account than this book. *Alien species in Norway – with the Norwegian Black List 2012* is also available in pdf-format on the same web-site, together with various factsheets for a selection of those species involved.

Definitions and delimitations

What is an alien species?

The term *alien species* is used in preference to the term *introduced species* since introduced is associated with deliberate actions, whereas *alien* is considered to be more neutral (Gederaas et al. 2007). The most problematical alien species are often termed as either *invasive* or *invading species*. A synonym term to alien species is non-native species.

Species are considered to be alien if they have been assisted in reaching the country, actively or passively, as the result of human activities. The definition alien species itself is in accordance with the International Union for Conservation of Nature (IUCN) own definition:

"Alien species" (non-native, non-indigenous, foreign, exotic) means a species, subspecies, or lower taxon occurring outside of its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could not occupy without direct or indirect introduction or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce (http://data.iucn.org/dbtw-wpd/edocs/Rep-2000-052.pdf).

Based on the above definition, NBIC has decided to include the following species:

1. Species deliberately released into the wild in Norway
2. Species that have escaped from captivity and breeding, or naturalised from cultivation or commercial interests
3. Species that have arrived as stowaways during transport / movement of people, animals, plants and goods
4. Species spread through own, unaided expansion from wild populations in neighbouring countries where their origins are due to 1), 2), or 3)
5. Species with non-specific anthropogenic origins where information on expansion potential is lacking
6. Selected 'door knockers' (see Box 3)

Only alien species down to **species level** are included, with the exception of some subspecies of vascular plants* (see chapter on "The work of the expert groups"). All species which have been observed *in the wild* in Norway *and* have arrived through the help of humans are in this context considered to be *alien species* in Norway. Exactly which areas are included is dependent upon what is appropriate in order to assess the individual species ecological impact status in Norway. A starting point is to define *Norwegian nature* according to the categories used in Halvorsen et al. (2009). See Box 1 for an explanation as to the meaning of the term *Norwegian nature*.

Time delimitations

Assessments as to which species have the potential to become established and present an ecological impact are considered within a future perspective of 50 years. This follows a precautionary principle.

A historical cut-off point has also been selected in determining which species ought to be considered as being alien. Alien species in Norway includes **species which have arrived in the country after 1800 A.D.** The reason behind such a time definition is that there is little documentation as to whether species have arrived unaided or with human assistance farther back in history. However, some vascular plants are considered as being alien to Norway if they were first recorded before 1800, but which had no reproductive populations until after 1800. In this way it was possible to include species which could have typical periods of dormancy during reproduction and dispersal, such as for example *Acer pseudoplatanus*.

All species with established populations in Norway before 1800 are considered as being native. To what extent a species shall be considered as native if it has been reintroduced is not an easy question. If we go some thousands of years back in time, then both *Ovibus moschatus* and *Sus scrofa* occurred in Norway (Bevanger 2005). Both of these species are included in the list of alien species as they have not occurred naturally as part of the Norwegian fauna for many thousands of years. See Box 2.

Geographical delimitations

The impact assessments cover Norwegian territories in the northern hemisphere. The areas included as being Norwegian territories are the same as used in the Norwegian Red List for species (Kålas et al. 2010):

- The Norwegian mainland (which includes the mainland itself as well as nearby islands) (ca. 324 000 km^2)
- Svalbard (Spitsbergen and surrounding islands as well as Bjørnøya and Hopen as defined under the Svalbard Treaty of 9th December 1920) (ca. 61 000 km^2)
- Maritime waters around mainland Norway which, in addition to Norwegian territorial waters (i.e. all oceanic areas within the territorial boundary), also includes the Norwegian economic zone (200 nautical miles, as defined under legislation of 17th December 1976) (ca. 965 000 km^2)
- The Fishery Protection Zone including territorial waters around Svalbard (200 nautical miles, as defined under legislation of 15th June 1977) (ca. 861 000 km^2)
- The Fishery Zone including territorial waters around Jan Mayen (200 nautical miles, as defined under legislation of 23rd May 1980) (ca. 293 000 km^2)

Separate assessments have been made for vascular plants and mammals in Svalbard.

'Door knockers'

'Door knockers' are defined as:

1) alien species in neighbouring countries that are considered to be able to establish themselves in Norway

through secondary introductions (species which can spread by self-dispersal from wild populations in countries bordering Norway, but which are considered as alien species in that country)
2) species with a likelihood of being spread to Norway via manmade vectors and which have species characteristics allowing them to establish themselves and reproduce in Norway
3) species which conform with the definition *alien species*, but which (at present) only survive and reproduce in artificial structures and habitat types which are not defined as *Norwegian nature*, and which are considered likely to be able to become established in *Norwegian nature* during the next 50 years.

The groups of experts have used available knowledge on potential 'door knockers' in order to choose which species to be assessed. Some species that preferably live in greenhouses and aquarium fish are examples of species under point 3). Only a selection of 'door knockers' are dealt with and risk assessed. The assessments of the 'door knockers' are based primarily on experiences from abroad, although they are adapted to suit Norwegian conditions. An example of a 'door knocker' is shown in Box 3.

Box 3

'Door knockers'

A 'door knocker' is narrowly understood as an alien species which has not yet arrived in Norway, but which is expected to arrive here and establish reproductive populations in the near future. This might be an alien species which is already established in one of our neighbouring countries, and which unaided can manage to cross national boundaries into Norway. This is called secondary introduction. It might also be a species with a natural range in other geographical areas which potentially can be spread to Norwegian territories with the aid of anthropological vectors e.g. as a stowaway with boats or cars, import of soil, plants, foodstuffs etc.

In a wider sense 'door knockers' can also include alien species already present in Norway, but which do not reproduce in areas where they might affect native biodiversity. This can apply to, for example, species which initially only survive indoors, in greenhouses or in compost heaps.

Indoor species can also be considered as potential 'door knockers'. Here, plant-eating (phytophagous) insects associated with alien plants are an important group. *Liriomyza huidobrensis* is an example of a 'door knocker' which was introduced to greenhouses as a stowaway on European plants, but which has not yet succeeded in establishing itself in Norwegian nature due to low winter temperatures.

Some fungi can be difficult to separate as being 'door knockers'. Here, there are a number of species which occur indoors or in greenhouses which are probably imported from more southerly / tropical areas, and which can occur outdoors in the Nordic climate. With climatic change and milder winters these species may have an increased potential to establish themselves in Norwegian nature. An example of one such species is *Leucocoprinus birnbaumii*, which occurs indoors, in greenhouses and in flowerpots. This species has also been recorded outdoors on one occasion, in a waste-heap with heat generation. The species is recorded outdoors in our neighbouring countries and is considered here as being a 'door knocker'.

Under the project *Alien species in Norway – with the Norwegian Black List 2012* we have chosen to use the broadest definition of 'door knockers' and have therefore included species surviving indoors, in greenhouses etc.

An example of a potential 'door knocker' *Liriomyza huidobrensis*

Photo: Erling Fløistad

Alien species classified into four groups

The result of the definitions that are used in relation to the term alien species, 'door knockers' and the guidelines which apply to which species are to be considered, is the collected overview in *Alien species in Norway – with the Norwegian Black List 2012* (see Appendices 1-4) which is divided into 4 groups:

1) alien species in Norway (with a potential to reproduce in Norway within the next 50 years**)
2) 'door knockers'
3) alien species which are observed in Norway, but which according to existing data are considered not to have any possibility to reproduce in Norwegian nature within the next 50 years
4) species previously defined

Species not included in the assessments

- Native species to Norway currently spreading to new areas as a result of human activities***
- Species that are imported into Norway, but which already have native populations
- Propagated, native species spread in Norway, including gene-modified organisms (GMOs) and genetic variants
- Subspecies or lower taxa (except vascular plants)
- Single-celled organisms

We have not included gene-modified organisms (GMOs) in this project. As early as 1993 a gene technology law was passed in Norway ("Gene Technology Act") (Ministry of the Environment 1993) which decides how organisms with artificially altered hereditary material shall be treated when they (for example) are introduced into the environment, as well as what genetic modifications are permitted to be made.

This current treatment of ecological impact assessment of alien species in Norway focuses only on alien organisms down to species level (except*), and does not include genetic variants of native species. The impact assessments do not cover native species spread within Norway. This is a practical approach, and does not necessarily mean that these groups are of lesser importance in terms of impact assessments than species which are included in this product. Ecological impact assessments of such groups ought to be dealt with in a thorough way in another project.

Species which have followed mankind are to a large extent species from which we gain direct benefits. Domesticated animals have consequently become spread across the globe. Livestock and cultivated plants are not included in this overview of alien species, except for cultivated plants which are observed naturalised outside cultivated areas. Pets, research animals and houseplants are likewise not included.

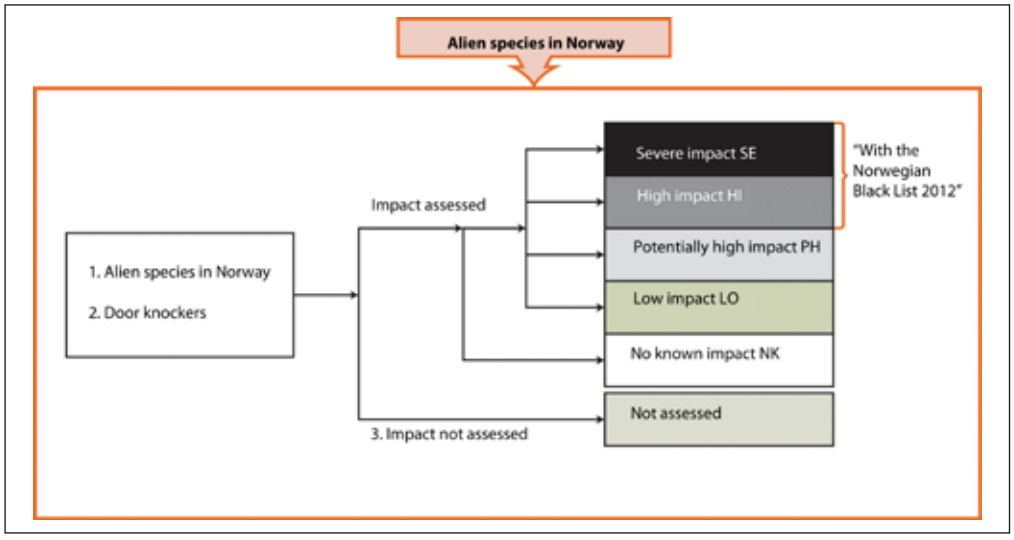


Figure 1. Overview of the categories used in *Alien species in Norway – with the Norwegian Black List 2012*. Species which are assumed to be unable to produce fertile offspring in Norway are excluded. Over half of the 'door knockers' which are included have been impact-assessed.

*) Some vascular plants down to subspecies level can be included in the assessments since there are differing botanical traditions regarding the definition of species. Here we include distinct subspecies of vascular plants with differing development history and distribution patterns, and where such separation is believed to have occurred at least 8 000 to 9 000 years ago (the end of the last ice age or earlier). Some other botanical traditions in Europe treat these as proper species (cf. Kålås et al. 2010).

**) One shall use either total number of years or total number of generations, dependent upon which of these results in the highest subcategory.

***) The exceptions are species which are introduced between Svalbard and the mainland together with Jan Mayen (see delimitations above).

Box 4

Assessments are limited to ecological effects only

An alien species is often defined as harmful if its presence can threaten native biodiversity, the health of domesticated animals and plants, or have negative effects upon health and society. The impact assessments of alien species carried out on behalf of NBIC are, however, based only on **ecological** criteria. Economic consequences or diseases in man and domesticated animals are not included in these assessments. As a consequence of this, species known to transmit serious illnesses to man or domesticated / cultivated species may be placed in a low or relatively low category of impact in an ecological assessment.

Examples of species where neither economy nor disease are emphasised are *Globodera pallida* and *Globodera rostochiensis*, also known as potato cyst nematodes. These are roundworms that live parasitically on the roots of potatoes and other species in the Solaneaceae family. Potato cyst nematodes are considerable problem species and they cause large-scale damage to potato crops in cool temperate areas (OEPP/EPPO 2009). The extent of damage is directly related to the proportion of nematode eggs per unit of soil. It has been estimated that around 2 t/ha potatoes may be lost where there are high densities of potato cyst nematodes (OEPP/EPPO 2009).

Photo: Bonsak Hammeraas, Norwegian Institute for Agricultural and Environmental Research, Plant Health & Plant Protection Department

Globodera rostochiensis

These species originate from South America and probably evolved in the Andes Mountains around 15-18 million years ago. *G. pallida* has been introduced to Europe from South America probably via import of potatoes as propagation material against dry rot in 1850. The northern limit of its distribution today is anticipated to be the Arctic Circle. Changes towards a warmer climate may lead to a further spread northwards.

Photo: Bonsak Hammeraas, Norwegian Institute for Agricultural and Environmental Research, Plant Health & Plant Protection Department

Globodera pallida

Due to the fact that these species are mainly a threat towards manmade areas, and are not considered as a major threat towards biodiversity, they are not assigned higher than a medium risk category. The species are placed in the category potentially high impact (PH) on the basis of the considerable risk of spreading from cultivated agricultural ground.

The effects of spread of disease and transmission of parasites to native species will influence the assessments and contribute to the assigning of a species in a higher impact category. An example of this is *Echinococcus mulitiocularis*, a 'door knocker' which is expected to spread to Norway in the space of a short time. The species is a flatworm which can cause human echinococcus, a zoonose which can lead to liver failure in man (WHO Informal Working Group on Echinococcus 1996). This species is categorised as having a severe impact (SE), not because of its effect upon humans, but because it poses a negative effect upon its host which can be easily emaciated with reduced reproduction. The main host species in Norway are likely to be *Vulpes vulpes* and *Vulpes lagopus*.

Extent of existing knowledge

Alien species in Norway – with the Norwegian Black List 2012 is based upon today's current knowledge on alien species in Norway, and adjacent areas. A total of 2 595 species are dealt with. Of these, 2 320 species are recorded as alien species in Norwegian territories. Of these 2 320 species, 1 180 are capable of reproduction and are impact-assessed. In the case of species grouped as "alien species recorded in Norway but which according to existing data are considered not to have any possibility to reproduce in Norwegian nature within the next 50 years", 1 140 species are included (1071 in Norway and Norwegian waters and 69 in Svalbard). In addition, 203 species are recorded as 'door knockers', of which 134 of these are impact-assessed. Other species which have been treated by the expert groups, but which do not comply with the current definition of alien species and limitations, are included for completeness, a total of 72 species.

The ecological impact assessments of alien species are based only upon **ecological** criteria and are **not** assessments of economic consequences of establishment of alien species in Norway. In addition, neither aesthetic nor health (anthropocentric) considerations are made. Such effects ought to be treated by other bodies. The experts have nonetheless had the opportunity to suggest these types of aspects during documentation of criteria.

Information regarding limitations within each species group can be found in the chapter on "The work of the expert groups".

What is the Black List?

Since the launch of the Norwegian Black List 2007, there has been a deal of misunderstanding regarding what a "Black List" actually is. We have often seen that all species included in the Norwegian Black List 2007 have mistakenly been interpreted as posing a severe impact and that the Black List is synonymous with a list of unwanted species. *Alien species in Norway – with the Norwegian Black List 2012* covers alien species in general. The two categories which indicate the highest impact – SE (severe impact) and HI (high impact) – make up the Norwegian Black List 2012.

The Black List is also an overview of alien species which present the highest ecological impact towards native biodiversity, and is not an assessment of which species are unwanted in Norway. It is the responsibility of the authorities to consider whether a species is unwanted or not.

Photo: Frode Falkenberg

Helix pomatia is well established in Norway, and is currently spreading. The species thrives in man-made environments such as gardens, parks and wasteland. The species is originally from Central and South-eastern Europe and was introduced to Norway in the 1950s.

Alien species: introduction, establishment and spread

By Reidar Elven, Frode Ødegaard, Eivind Oug and Hanno Sandvik

Alien species are, in biological terms, defined as species that have been spread from one biogeographical region where they are native, to another biogeographical region with the aid of man, whether intentional or unintentional. The term biogeographical region is used because political units (such as nations) have no established basis in biology. Thus the crab *Paralithodes camtschatica* is defined as an alien species in Norway, even though the species was originally transferred from the Pacific Ocean to the Barents Sea within the national boundaries of Russia, and its spread into Finnmark has occurred without further aid from man. The species had already been transferred by man to our own biogeographical region (the Barents Sea), and is therefore considered as an alien species.

Problem species are defined as species that have negative effects upon native species and habitats, regardless as to whether they are alien or not. For example, many consider the following species as problem species: *Artemesia vulgaris* which is an expansive weed and which also causes pollen allergy, *Aegopodium podagraria* which is an expansive weed on nutrient-rich grasslands and woodlands, and the tick *Ixodes ricinus* which is a vector for several types of disease, some of which are new, in mammals including man. A further problem species is *Juncus bulbosus* which has become a serious nuisance plant in streams, rivers and lakes, forming dense stands displacing most other water-plants (often to a greater degree than *Elodea canadensis*). All of these are problem species, although they are not alien species according to the definitions. *Artemesia vulgaris*, *Juncus bulbosus* and *Ixodes ricinus* are native species, which arrived in Norway thousands of years ago without the aid of man. *Aegopodium podagraria* has certainly been brought here by man, although was well established before 1800, which is the historical time limit for this project. See Figure 2.

Nature is constantly changing and has always done so. Environmental factors, and not least climate, affect distribution of both plants and animals. During a given period the flora and fauna within a biogeographical region will alter in character (Begon et al. 2006). Ecosystems rarely, if ever, are able to remain unchanged over longer periods of time such that they form completely "stable" systems. Climax community (Clements 1916) is a theoretical end stage that ecosystems develop towards, slowly or rapidly, but which they rarely, if ever, reach before changes in their natural environment lead to a change in direction. Slow changes take place

Aridius nodifer
Photo: Karsten Sund/Torstein Kvamme

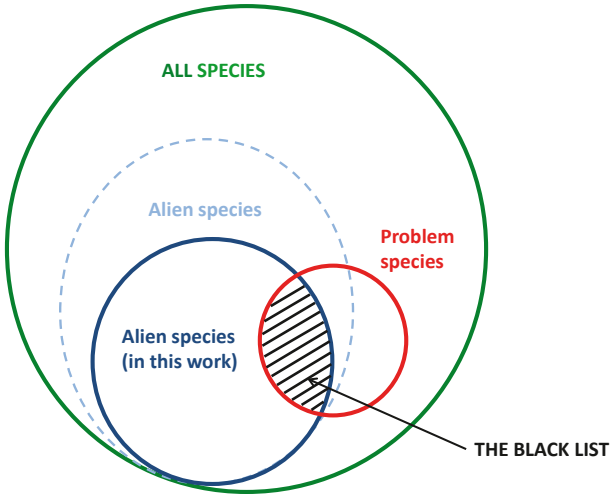


Figure 2. Problem species seen in relation to alien species and species on the Black List.

even within relatively stable ecosystems (Willis & Birks 2006), and species come and go.

Alien species are an integral part of our – human – environment and have been for a long time. Ever since mankind began to cultivate plants and breed livestock, perhaps almost 10 000 years ago, food plants and beneficial animals, their parasites, and weeds, have followed us during movements around the world. Some authors reckon that such "food supplies" of plants and animals which provide starches and other carbohydrates, proteins and fat (such as cereals, peas and beans, sugar plants, dairy animals, animals kept for meat, as well as draught animals) are the foundation for all more advanced civilisations. They also consider that those parts of the world where there were no natural foundations to provide similar "food supplies", failed to developed extensive farming and town cultures before such "food supplies" were introduced, usually by Europeans from the 15th century onwards (Diamond 1997). This applied for example to Australia, most of Africa south of the Sahara, North America, and Northern Asia north of China and Mongolia. In Norway, the first alien species probably arrived at the same time as the first farming, in other words perhaps 4 000 – 5 000 years ago. Since then, both utility species and stowaways have become part of the Norwegian fauna and flora.

A considerable proportion of the selection of plants found today in rural landscapes in Norway – and valued as species of semi-natural sites – may be alien species in the sense that their presence in Norway is the result of man's activities and import. This applies for example to plants such as *Ranunculus acris*, *Leucanthemum vulgare*, *Achillea millefolium*, and *Centaura jacea*. The same applies to many newly arrived alien species. There are few that will interpret such signs of spring as the flowering of *Tulipa sylvestris* in Sørlandet (southern Norway), *Narcissus pseudonarcissus* in Aukra in Romsdal, lawns with *Crocus* and *Hyacinthoides non-scripta*, and the tall, dry grasslands with *Noccaea caerulescens* as posing any problems for Norwegian nature. Alien species are therefore not only negative; many of them are the very foundations upon which our present society is based (livestock, cereals, berry-bearing and fruit plants, vegetables). It is therefore essential to differentiate between alien species in general and alien species which have negative effects on native nature (see Box 5). Here, we must also remember that native species can also create problems, dependent upon ones viewpoint.

During preparation of impact assessments on alien species in Norway, it was decided to choose the year 1800 as a temporal cut-off point (see Box 2 in the introduction). Many countries operate with the "discovery" of America (i.e. 1492), although only as a concept and not necessarily as the basis for classification. The cut-off point of 1800 is not as arbitrary as it might seem. Firstly, there is little biological information that can be traced to species from the 18th century or earlier. If the time limit were to be set at, for example, 1700 or 1600, then it is unlikely to find data to indicate whether an alien species arrived before or after that point in time. Secondly, introduction of species is strongly associated with human behaviour, and especially human movements, and this underwent great changes in the latter half of the 18th century. Even though Norway was part of an international network with movements within Northern Europe and across the Atlantic Ocean both before and during the Viking age, and in particular in the Middle Ages up until the plague (Black Death) in the 14th century and including the period of the Hanseatic trade, it was not until the 18th century that Norway became an integral part of a much broader network of international transport. This involved export of timber and fish to large parts of Europe as well as other parts of the globe. This activity led to import of alien species into Norway, either through deliberate import or as stowaways with goods or ballast soil on board ships.

Up until then , most transport was mainly between Norway and the neighbouring countries around the Baltic, the Skagerrak and the North Sea (and, up until the Black Death, also to and from Iceland and

Greenland). Homogenisation of fauna and flora within this region had already taken place for over 1 000 years prior to 1800. The end of the 18th century and the beginning of the 19th century therefore represent a new development in terms of import of alien species to Norway. The same situation happened much earlier farther south in Europe – in Spain and Portugal following the great discoveries of the 15th and 16th centuries, and in France, the Netherlands and Great Britain with the advent of colonialism in the 16th and 17th centuries.

Far from all new species in Norwegian nature are alien species. Species come and go even without the influence

Box 5

Not all alien species are problematic …

Photo: Eli Fremstad

Noccaea caerulescens

Noccaea caerulescens is a mid-European, low-growing crucifer with a rosette and conspicuous inflorescence which flowers in early spring. It arrived in Norway with seed for the botanical garden in Oslo in the early 19th century, and later with seed mixes, probably from mid-Europe, for improving meadows (Elven & Fremstad 1996). It was first discovered naturalised in 1874. It spread slowly until 1900, and subsequently more rapidly, and by the 1930s had already reached the range limit of today, as far north as southern Troms. It is now established (naturalised) throughout most of southern Norway, and a few places in northern Norway. In dry meadows and slopes, banks, rocks and roadside embankments and similar sites it grows apparently without presenting any threat to native species with equivalent requirements for the growth locality. The same applies for some other newcomers. They must be considered as harmless.

….but some become so in the course of time

A number of rare and threatened vascular plants in Norway grow in dry, open and calcerous places, especially along the Oslo Graben from Mjøsa south to Grenland. Richest of all are the islands and peninsulas of the inner Oslofjord. *Vincetoxicum rossicum* was first observed at Ekeberg in Oslo in 1865, in 1872 at Bygdøy, and in 1952 at Malmøya. For a long time it was considered a botanical curiosity found only at a few sites. In light shady conditions it grows to ca. 2 m in height and climbs upon other plants. Today *Vincetoxicum rossicum* grows on half of the islands and is also found several places on the mainland beside the fjord. It has become a threat to dry slopes and meadows, as well as to threatened species.

Photo: Eli Fremstad

Vincetoxicum rossicum

of man. Climate is not, and has hardly ever been, stable, at least not during the past 2–3 million years which have been among the 3–4 most climatically unstable periods that are documented during the Earth's history (besides the Ice Ages during the transition between the Precambrian-Cambrian and the transition between Carboniferous-Permian, which were respectively around 550 and 320–270 million years ago). The evolution of new species, large scale movements, and species extinction have all been natural and inevitable. New species arrive in Norway every year, regardless of man. Some species disappear, even without the influence of man.

With nature being so dynamic and changes taking place naturally, what is the problem with alien species?

A huge increase in the human population and a wide range of activities with consequences for the environment have led to alien species in many regions having increased dramatically during the last 200 years (di Castri 1989). The modern spread of alien species can be considered to be a gigantic homogenisation process where species are assisted by man to cross natural barriers. These natural barriers are the main reason why the Earth has such a great biodiversity in the first place (Harrison 1993, Lodge 1993, Brown 1995, Vitousek et al. 1996, Myers 1997, McKinney & Lockwood 1999). Spread of alien species therefore counteracts one of the main processes which causes and maintains global biodiversity: isolation barriers. The negative effects alien species can have in terms of a threat towards

Box 6

Black List or Red List?

It is often difficult to ascertain or determine the likelihood as to whether a species is native or introduced, and in some cases this can have consequences for its status for red-listing or black-listing. Sorbus intermedia and Tilia platyphyllos are two common park trees in Norway. *Sorbus intermedia* is a native species around the southern Baltic Sea, and in Sweden occurs almost to the border with Norway. *Tilia platyphyllos* is mainly a mid-European species, but with an isolated small outpost in Bohuslän. The majority of Norwegian occurrences for both of these species today are the result of planting and naturalising, although both may have a few natural occurrences in Halden in Østfold, towards the border of Dalsland and Bohuslän where they are undoubtedly native. If they are not native then they might have the potential to arrive in Norway unaided from Swedish populations in very close proximity. This puzzle can probably be solved using genetic markers, although no studies have been carried out to date. Both these species are appropriate for a high red list category if they are native, and both are expansive when introduced. *Sorbus intermedia* is also a problem species. The same taxon cannot be on both the Red List and the Black List at the same time. The same species can, however, appear on both lists if two or more subspecies are present in Norway (e.g. *Leonurus cardiaca*), but this is not possible if no indications of race-formation are known. A pragmatic solution has been chosen for *Tilia platyphyllos* and *Sorbus intermedia*. Tilia platyphyllos is considered to be native and is included on the Red List for species 2010 (Kålås et al. 2010), whereas *Sorbus intermedia* is considered as being an alien species because any remaining native populations must already be strongly "polluted" by the amount of introduced naturalised trees. *Sorbus intermedia* is recorded as naturalised with around 250 occurrences and there may perhaps be 5 times as many, with an estimated 12 500 naturalised individuals in Norway (NBIC's web-site). *Sorbus intermedia* hybridises with other *Sorbus* species, and to some extent with species included on the Red List. *Sorbus intermedia* is here considered to be an alien species, its impact has been assessed and placed in a category which qualifies for black-listing.

Sorbus intermedia at Ekebergskråningen, Oslo

biodiversity, both locally and globally, have received more and more attention in recent years.

The same alien species which cause loss of biodiversity are often those that lead to damage and economic loss for various sectors of society and business interests (Pimentel et al. 2001, 2004, D'Antonio & Kark 2002, Pimentel 2002, McGrath & Farlow 2005). Alien species such as *Reynoutria japonica* introduced into Europe and *Lythrum salicaria* introduced to North America, cost millions each year to ensure that waterways are kept open. The same is true for *Eichhornia crassipes* in almost all tropical areas.

Several European grassland species whose fruits are adapted to allow dispersal on the coats of animals including some which burrow into the skin and some which destroy the oesophagus when eaten, lead to mass deaths of livestock in agricultural areas in North America and Australia. The economic consequences are thus given wide attention (Naylor 2000). Considerable costs have been documented in primary industries such as agriculture, forestry and fisheries, as well as for our own health (Pimentel et al. 2002, 2004). In the USA, alien species are estimated as causing economic loss amounting to almost $120 billion (USD), and that around 42% of species on the Red List are especially threatened by alien species (Pimentel et al. 2004).

Native or alien species?

In the case of many species, we have too little information to be able to say whether or not a species may be alien based upon the definitions used here. This applies in particular to the historical time limit of 1800 A.D. Even for the best known groups, vertebrates and vascular plants, detailed information is lacking regarding what was found in Norway more than 200 years ago. In the case of invertebrates, algae, fungi, mosses and other groups of small organisms, there is virtually no information available until well into the 19th century. In marine environments, only a few species from coastal and fjord areas were known before around 1850. Systematic surveys of marine organisms began to be carried out first during the 1860s and 1870s through the pioneering work of Michael Sars and his son G.O. Sars. They participated in expeditions around the country and were the first to record life at greater depths than about two hundred metres. Even today there is still only limited information for some taxa about which species exist, and almost no information as to whether a species is native or introduced; and, if introduced, as to when it might have arrived in the country, and on species abundance. This applies to, amongst others, several harmful species of plants (Sundheim et al. 1994) and to poorly known groups of invertebrates (Tømmerås et al. 1994).

In the case of vascular plants, there are several literary sources from the 18th century, although it is often difficult to relate these descriptions to specific species, as we define them today. The only verifiable source is pressed plant material which can be re-examined and identified. The most important contribution from the 18th century is the Flora Norvegica by J.E. Gunnerus (Gunnerus 1766, 1776) and the verifiable documentation in the Gunnerus herbarium in Trondheim. The value of this publication and collection for an assessment of the time of alien species arrival is, however, somewhat limited. Most of the collecting was done during Bishop Gunnerus' religious journeys between 1759 and 1770 in Møre, Trøndelag and northern Norway, which are some distance from the main sites of introduction of alien plants. More detailed work first started around 1820 by M.N. Blytt, centred around Oslo. We have assumed that species that were already known from several parts of the country and which were already well established have probably arrived before 1800. In this case, Blytt (1861, 1874, 1976) has been an important source who summarises information from the beginning of the 1800s and often includes information on where and when the first find was made.

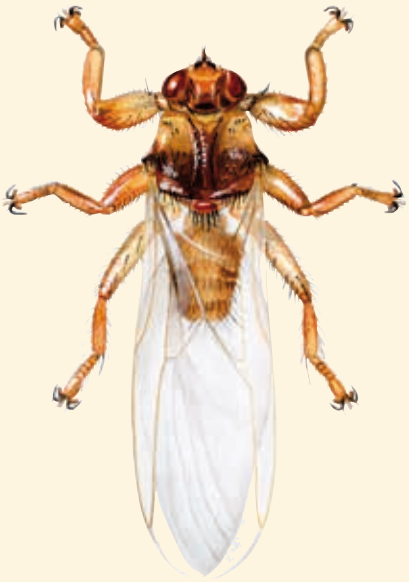
In the case of insects, it is very difficult to trace data much further back in time than to the beginning of the 1870s, when most insect groups were catalogued by Johan Heinrich Spalckhawer Siebke (1816–1875). However, these catalogues are somewhat incomplete due to little available data and to taxonomic challenges. It was not until the early 1900s that available data was extensive enough for today's well-known insect groups, such that we can decide whether a species is alien or native. By comparing sources from neighbouring countries with the Norwegian sources, one can often identify which species are alien and when in historical terms they arrived. (See for example Ødegaard & Tømmerås 2000).

There is a long list of insect species that are associated with plants which are here defined as being alien. This does not mean that insects living on such plants also must be considered alien. There are many cases whereby native species of insects find an additional resource, and as a result an increase in population, following

Box 7

Problematic, but not alien: *Lipoptena cervi*

Deer flies belong to the family Hippobosicidae within Diptera. All are blood-sucking parasites. Eight species are found in Norway, of which five are found on birds, one on horses, one on sheep, as well as *Lipoptena cervi* which normally affects deer (Cervidae). It is not unusual for *Lipoptena cervi* to bite humans, although in the main the species is a particular problem for moose, where severe loss of hair and emaciation can lead to death. *Lipoptena cervi* can probably also spread disease as it is a vector for, amongst others, Bartonella bacteria. There is no doubt that *Lipoptena cervi* is a problem species, but is it an alien species?



Lipoptena cervi
Illustration: Hallvard Elven, source: Norwegian Institute of Public Health

Lipoptena cervi was first recorded in Norway in 1983 in Halden. Since then it has spread northwards to Hedmark and Oppland and westwards as far as southern Telemark. The species is thus a newcomer to the Norwegian fauna. Spreading into Norway appears however to be the result of natural expansion, and as such the species cannot be defined as alien. There is much to suggest that the natural expansion is the result of increased deer populations, perhaps in combination with a milder climate. It can be argued that these climate changes are caused by man and that we therefore pave the way for natural expansion of problem species, but if so then the expansion of almost all new species into Norway could then be defined as alien species. *Lipoptena cervi* is an example of a native species which can be percieved as a problem species, but which is not defined as an alien species.

the introduction of an alien plant. There are also cases where a natural range expansion results from the introduction of a plant, which can be considered to be a case of habitat change. The beetle *Heterhelus scutellaris* is an example of this. In many cases, however, it is difficult to determine whether an insect species has arrived naturally or whether it has arrived as a stowaway during plant introduction. There are many examples of this, particularly of Coleoptera (beetles) and Lepidoptera (butterflies). Such species are not considered as being alien in this report. In obvious cases, such as Curculionoidea (weevils) brought in with ornamental plants and agricultural plants, such insects are defined as being alien and are included in the assessments.

Even in the case of species or other taxa first recorded after 1800, there may be uncertainty as to whether they have arrived unaided, through human aid, or via both factors (see Boxes 6 and 7). Box 6 illustrates how two such species are treated as regards inclusion on Red or Black Lists, whereas Box 7 describes a problem species occurring in Norway, but which is not alien.

Marine species often have good natural dispersal capabilities, and many appear annually, having arrived with the help of ocean currents. Therefore, it can be difficult to determine whether species observed for the first time have arrived unaided or with the aid of man. Mapping of marine species is, with the exception of species of economic importance, insufficient, and it is often impossible to say anything about a species' natural distribution range. A proportion of species which are native in neighbouring coastal waters, and which have the potential to spread naturally into Norway, may well have occurred regularly without being collected and identified. With changes in climate and sea temperature, or with changes in ocean currents, some species may have become more regular and more obvious. In order to ascertain whether a species is alien or not, we need to have good knowledge about the species' natural distribution and ability to disperse, something which we often know little about. If these species are alien in our neighbouring countries, then they are also alien species here, regardless as to whether they have arrived

unaided or not. The background history for some alien species, such as *Sargassum muticum* and *Paralithodes camtschatica* are on the other hand relatively well documented, see Boxes 8 and 9.

Where do alien species come from?

Where alien species come from is dependent upon the vector responsible for its import, in other words how it got here. Extensive import of *Eucalyptus*-timber from Brazil to Norwegian paper mills has unsurprisingly led to the import of alien stowaways, although it is unlikely these will become established in Norway. Which species actually become established is mainly determined by their area of origin.

Ecologically, we have a great variety of terrestrial ecosystems with many and more or less contiguous areas, ranging from dry to wet habitat types, nutrient-poor to nutrient-rich and calcareous, and including woodland, mires, open heaths, grasslands, rocks, and semi-natural sites of varying types. There are equivalent variations in fresh water. The coastline of Norway is the longest and most varied in Europe. There are wide differences in water salinity (salt content) and in sea bed environments, from hard substrates to soft sediments, from brackish pools and almost freshwater estuaries to tidal meadows, sand shores and boulder shores, and from very sheltered to very exposed stretches. Much of the same applies to oceanic waters, with a span from semi-brackish and temperate surface waters in the Skagerrak and in the fjords to rather saline water masses on the outer coast of Vestlandet and northwards to the Arctic in the Barents Sea. Alien species with widely different requirements for survival can as a consequence find acceptable conditions, allowing their establishment.

The main limiting factors are climate and light, yet here there are also varied conditions, between 58° to 78°N (81°N with the inclusion of Svalbard) and from 6° to 31°E (almost 34°E if we include Svalbard). The range of biogeographical zones stretches from boreonemoral, bordering nemoral in Agder, to southern arctic in Finnmark (with polar deserts on Svalbard), and in terms of biogeographical sections from strongly oceanic in Western Norway to slightly continental in inner parts of Eastern Norway and Finnmark (and perhaps strongly continental on Svalbard), see Moen (1999).

Box 8

Spontaneous spread with sea currents: *Sargassum muticum*

Sargassum muticum is a brown alga which originates from Japanese waters. In its native area the species rarely becomes more than about 1 m long. Early in the 1970s the alga was introduced to the coast of Brittany as a stowaway with imported oyster larvae. It quickly spread to both the French and English sides of the English Channel (Rueness 1989). Since then sea currents have transported it further. In 1984 fragments were found in Southern Norway (Norwegian Skagerrak area), and in 1988 the species had established permanent populations along the coast of Southern Norway, where it is now common. The species has also spread northwards as far north as Runde (Møre & Romsdal county). It is expected that the species will spread further. It spreads by annual side-shoots with floating bladders. These loosen from the stem and drift with water masses. It is been recorded that this species of alga grows very well at increased water temperatures, and specimens of over 10 m are recorded. The species competes for space with *Saccharina latissima*, without it being documented as displacing native species (Rueness 1989, Steen 1992, Bjærke 2000).


Photo: Vivian Husa

Sargassum muticum has numerous small floating bladders which lift it up to the water surfac

Box 9

Paralithodes camtschatica – a problematic, yet delicious, alien species

Paralithodes camtschatica was released by Russian scientists into outer parts of the Murmansk Fjord from 1963-1969 with the intent of becoming a resource for commercial fishery. In 1977 the first specimen was recorded in Norwegian waters, when a crab was caught in a net set for halibut in Varangerfjorden. The population in Norwegian waters grew rapidly from the mid-1990s and has since remained high in eastern Finnmark, although has in recent years declined somewhat. New calculations estimate the population of adult crabs in Norwegian waters to be at least 4 million individuals (1 575 tonnes of catchable crabs), see Sundet (2012). *Paralithodes camtschatica* is spreading westwards and has now a continuous distribution to northern Troms. At the same time that *Paralithodes camtschatica* is an alien species, it has also become an important commercial resource for some coastal communities and an attractive food resource. Norwegian authorities have therefore defined an area for commercial harvest which extends from the North Cape (Nordkapp) to the Russian border, where the crab stock is managed by a quota-regulated fishery (Ministry of Fisheries and Coastal Affairs 2007). It is desirable to reduce the population west of the harvest zone and in the open sea as much as possible. It appears as though unrestricted fishing west of the North Cape has greatly reduced the spread of *Paralithodes camtschatica*. Farther south there are isolated finds of *Paralithodes camtschatica* from Lofoten, the Møre coast, and off Bergen, but these are perhaps the result of deliberate releases. *Paralithodes camtschatica* occurs in a number of different sea bed environments, from hard substrata with kelp forests, mixed sea beds, sandy sea beds, and soft sediments from the lower littoral zone to depths of several hundred metres. It is an active predator which eats a wide array of bottom-dwelling organisms, where in particular Echinodermata, large Bivalvia-species and Polychaeta and oligocaeta are important foodstuffs (Falk-Petersen et al. 2011). Recent studies in Varanger have shown that common Echinodermata and Polychaeta and oligocaeta in soft sea-bottom environments have been reduced by 70-90% (Oug et al. 2011). Grazing pressure has led to changes in the community of organisms, which in turn appears to have consequences for ecological processes in the sea bed sediment. It is assumed that a reduction in bottom-dwelling fauna reduces the nutritional basis for bottom-dwelling fish, although this has not been possible to document (Falk-Petersen et al. 2011). *Paralithodes camtschatica* is also a threat towards fish as it is a vector for parasites and microorganisms causing disease, amongst others a blood parasite that can be transmitted to Gadus morhua and Melanogrammus aeglefinus, although it is at present unclear as to what extent this occurs (Malovic et al. 2010). In the state of conflict between being an unwanted alien species and yet at the same time a resource, concrete knowledge about the spreading potential and ecological effects are very important as a basis for making the right decisions as to how the species be managed.

Photo: Anette Karlsen

Paralithodes camtschatica

The range is, in terms of both zones as well as sections, greater than in any other European country.

Even so, climate presents clear limitations. Alien species which shall survive in Norway, whether on land or in fresh water, must withstand winter frosts, snow or ice-cover during a large part of the year across almost the whole country, medium to very strong changes between winter and summer, a short to very short summer season, as well as a colder summer than farther south in Europe, and they must withstand the span from long day-length or midnight sun in summer, to short day-length or complete darkness in winter – in other words large variation in day/night-length in the south and extreme variations in the north.

The first "package" of alien species, those that arrived with early agriculture, originated mainly from western Asia and south-east Europe. This was supplemented with Mediterranean species (e.g. *Brassica oleracea*, *Alium porrum*, and a number of weeds) and with species from Central Europe during the northward movement of agriculture. Most of these species have had several thousand years to adapt, and are well integrated in Norwegian nature, and are today not considered as being alien species. Only a subset of the species with southern origins managed to establish in Norway; many more have become established in the agricultural landscape in Denmark and southern Sweden.

The more "modern" alien species originate mainly from areas with habitats and climates (including light conditions) which resemble the ones in Norway. For terrestrial organisms this means other northerly regions: relatively few from Great Britain, from Germany and northwards (almost within our own biogeographical region), very many from north-east Asia from Japan and China and northwards, very many from north-western USA and northwards. Relatively few originate from the inner, more continental parts of Russia, Siberia, inland Canada and USA. This applies to both vascular plants and insects. In the case of marine organisms, the east coast of North America (for e.g. *Homarus americanus*) and the northern Pacific Ocean (for e.g. *Paralithodes camtschatica*, *Crassostera gigas*) are important source areas. A number of algae arrived in Europe together with oysters (Ostreidae) which were imported to European countries from the northern Pacific Ocean (e.g. *Sargassum muticum*). Important sources for species found in brackish water and partly also fresh water are areas around the Caspian Sea and Aral Sea. A number of species from here, known as Pontocaspian species, have become established in the Baltic Sea following of a system of water-construction of canals in eastern-Europe, and have spread further to rivers and brackish water systems in mainland Europe, in Finland and in Sweden. The Mediterranean Sea is an area with many alien marine species, both as the result of import of oysters from Asia, as well as the opening of the Suez Canal leading into the adjoining Indian Sea. Many of these species have since spread further along the Atlantic coast.

One main source of alien species is the Mediterranean Sea area and western Asia, mainly as a result of the old settlement and agricultural history with several thousand years of adaptation to human land use. We have a large element of originally Mediterranean species among our alien species, in particular vascular plants, although these have gradually adapted to Norwegian conditions through a long history of agriculture. When they followed European farmers to other parts of the world during the 16th century, Mediterranean plants then caused large changes in habitats and species composition in four areas of the world with a Mediterranean climate: California, mid-Chile, the Cape Colony in South Africa, and southern and south-western Australia. Relatively few alien vascular plants have travelled the opposite way, with a few exceptions such as *Senecio inaequidens* and *Cotola coronopifolia* from South Africa. The first of these spread rapidly in Europe and into Norway, whereas the latter attempts to become established in Norway (see Box 13). *Campylopus introflexus* originates from southern South America, has expanded its range in Western Europe, and has now reached Norway. There are, however, very few species from the cold southern (austral) areas which have become established in the cold north (boreal). One reason may be that seasonal variation in temperature is much less in the south, as there is little land and much ocean. It is perhaps no coincidence that alien vascular plant species from New Zealand, Australia, the Cape Colony and southern South America have in Europe become particular problem species in Great Britain, Ireland and the Atlantic islands (Azores, Madeira, Canaries). The same is true for marine organisms. Very few species from cold waters in the southern hemisphere can survive transport or spread across the tropics.

The climate gradient also means that alien species that are documented to be invasive farther south in Europe, do not necessarily pose especially high risks in Norway under prevailing climatic conditions. This applies even for species which have reached Denmark and southern Sweden. Our problem species have often arrived from

the east (such as *Nyctereutes procyonoides*, *Paralithodes camtschatica*, and probably also *Chionoecetes opilio*), have been directly imported from North America or north-east Asia, or have had intermediate stations in Europe where they have proved to be less problematical than in Norway (such as *Heracleum persicum*). Secondary spreading to Norway, wherein a species has been imported to one or more places in Europe and so arrives unaided to Norway, is especially relevant for species arriving from the east.

How do alien species get to Norway?

Species have been transported and followed mankind between biogeographical regions ever since ancient farmers and other groups have moved around, i.e. for around 9 000–10 000 years or more. For almost as long, agriculture and deforestation have created suitable conditions for alien species to become established. Domesticated animals and plants from which we gain direct benefits, have as a result become distributed well outside their original distributional range, many with an almost global distribution today (Bevanger & Ree 1994, Pimentel 2002, Bevanger 2005). The first wave of alien species almost certainly arrived in Norway together with the first farmers, around 3 000–4 000 years ago, as domestic animals and plants, stowaways and parasites.

Up until 1000 A.D. global spread of species was rather limited. *Zea mays* (maize), which was Central America's most important food plant, had not yet crossed the northern Mexican deserts into North America, and did not arrive in California until after the arrival of Europeans. *Selanum tuberosum*, then the most important food plant in South America, had not crossed the Isthmus of Panama into Central America. European cereal crops and legumes had not crossed the Sahara or the Sahel into East Africa, nor had they reached East Asia, where *Oryza sativa*, *Panicum millaceum* and *Glycine max* waited to be taken westwards to western Asia and Europe (Diamond 1997). The same applied to livestock. Neither had the South American draught animals reached Central America, something which resulted in the rather amusing paradox that Central American people had invented the wheel, but lacked draught animals (and only used the wheel as a toy), whereas South Americans had draught animals, but lacked the wheel. As a result of discovery expeditions from the beginning of the 14th century onwards, such barriers were broken down. In more recent times, after 1500 A.D., the potential for alien species to spread dramatically increased, and in particular during the past 100–150 years as a result of considerable amount of travel and internationalising of trade (Hammond 1974, Samways 1999).

This report differentiates between four main groups of reasons for an alien species presence in Norway:

- Deliberately introduced or released
- Escaped or naturalised (i.e. after having been introduced for cultivation)
- Stowaways (accidentally introduced)
- Secondary spread from neighbouring countries where it originally arrived as the result of one of the three reasons above.

Below, we have in general differentiated between deliberate introductions (which apply to the two first of the above outlined reasons), accidental introductions (stowaways), and secondary spontaneous spread from a neighbouring area where the species is defined as an alien species. In addition, there has to be some definitions related to the term "Norwegian nature" that provides some flexibility. In this context we divide between natural areas and purely artificial areas, and between cultivated species and naturalised occurrences. We do not consider livestock or cultivated plants as being alien unless they have escaped from cultivated areas. As an example, *Ovis aries* is not an alien species in the wild in Norway unless they escape and begin to reproduce independent of livestock husbandry, something which sheep have not yet done (the semi-wild Norwegian "wild sheep" is also domesticated). *Oryctolagus cuniculus*, however, has bred in the wild. We exclude as part of Norwegian nature indoor and outdoor breeding facilities, gardens and plantations (including plantation forest) for those species which are cultivated there. In other words, an orchard is not Norwegian nature for fruit trees, but is so for the weeds under the trees themselves. Similarly, a field or a plantation is not Norwegian nature for *Hordeum vulgare*, *Triticum aestivum*, *Solanum tuberosum*, or *Picea sitchensis*, but is normally regarded so for many other species.

Intentional introduction

Most of our utility animals, pets, crop and ornamental plants are alien species that have been deliberately introduced into Norway for use in cultivation, in gardens or indoors. Many species have been released as new game animals, including the following three: *Phasianus colchicus*, which was introduced and released in 1875; *Dama dama*, which has been spread as a

game species from its original range in Turkey and the eastern Mediterranean to hunting estates around Europe already from the 16th century; *Branta canadensis* was introduced to Norway several times between the 1930s and the 1960s, and has since become the most numerous goose in many places. The same has happened with a number of fish species which have been released into watercourses. In Finland and in Russia, several mammal species have been released to increase the number of fur-bearing game animals, e.g. *Nyctereutes procyonoides*, *Procyon lotor*, and *Ondatra zibethicus* (see Bevanger 2005).In northern Russia several species have been released to increase catches in rivers and the sea, such as *Paralithodes camtschatica* and *Oncorhynchus gorbuscha*, with the resultant spread westwards into Norway.

Gardening has in the course of time resulted in trees, bushes, and ornamental herbs being collected from virtually all corners of the globe and then attempted to grow in Norwegian gardens. F.C. Schübeler, considered as the father of gardening in Norway, distributed seed and plant material over the whole country and described the results in for example *Viradium norvegica* (Schübeler 1886-1889, with addendum in 1891). Schübeler was probably one of the main sources for spreading of alien plants within Norway during the 19th century. Perhaps over half of the vascular plants regarded as problem species in Norwegian nature originate from import and further dispersal from ornamental gardens. In total, naturalised garden plants account for perhaps 25% of all alien species in Norway. In addition to these are park plants, plants which were sown during the 19th century and early 20th century to create more varied parks, particularly around large

Box 10

Garden refuse

It has been common practice when a garden plant becomes too big or surplus to dig it up and throw it out. At best the plant ended up in a compost heap or waste disposal site, but often ends up in unofficial dumps or along roadsides, woodland edges and edges of beaches where garden waste was of little nuisance, at least not until the plant began to spread. During a detailed survey in Lier municipality in the 1990s, almost 200 illegal dump sites were found, i.e. 1.7 per km^2 (A. Elven & R. Elven unpublished). Several tens of vascular plant species without self-reproduction have in this way become locally common e.g. sterile-seeded *Spiraea* hybrids and *Symphyotrichum* hybrids, or nationally as in the case of e.g. *Reynoutria japonica*, *R.* x*bohemica* and *R. sachalinensis* (Fremstad & Elven 1997b). The sterile-seeded hybrids *Spiraea* x*billardii*, *S.* x*rosalba*, and *S.* x*rubella* are documented with 209, 200 and 123 occurrences respectively in Norwegian nature, and we assume that the real figure is 3-5 times higher, i.e. an estimate of 1 700-2 600 separate dumping incidents of these three species alone (data from NBIC's web-site). If we multiply this total by the number of species involved (over 50), and then half this as not all species are equally common, then we arrive at a minimum total of 75 000-100 000 such "breaches of the law".

Photo: Oddvar Pedersen

Reynoutria japonica.

farms (e.g. Bogstad in Oslo and Fritzøehus in Larvik), as well as to increase grazing for game animals. A number of the old stately homes in Norway, from Østfold and Bogstad and north to Trondheim still have an element of naturalised park plants (Nordhagen 1954), for example *Phyteuma spicatum* ssp. *spicatum* and ssp. *caeruleum*, *Lillium martadon*, *Aristolochia clematis*, *Luzula luzuloides*, *Poa chaixii*, *Festuca heterophylla*, and many others.

Animals have also been introduced for aesthetic reasons. *Dama dama* were introduced more for aesthetic purposes than for hunting, such as at Hankø in Østfold. *Ovibos moschatus* was imported on several occasions, first in the period 1931–1938, but these died out during the Second World War, and then again between 1947–1953, when they became successfully established. When Gustav V and Queen Victoria built the summer residence of Solliden by Borgholm on Öland around one hundred years ago, the snail *Arion rufus* was imported from Germany and released in the park to make it an even finer place to be in (Bevanger 2005).

Being an important source of food fish species were among the first to become translocated. There are indications that as early as the Stone Age (around 6 000 years ago) *Salmo trutta* was released into fishless waters on Hardangervidda (Indrelid 1986, Kålås & Lura 1995). Such transport to previously fishless waters takes place even today. Until recently, it was only species native to Norway that were translocated. In recent decades spread of native fish and other freshwater organisms, as well as introduction of alien species, has increased considerably (Hokstad & Skurdal 1995, 1996). Careless use of living bait and deliberate release of species within Cyprinidae have in many places resulted in damage to fishing waters, introduction of new parasites and pathogens, reduced water quality and in sum a considerable reduction in biodiversity.

Mankind has for a long time kept animals for other purposes than provision of food and pulling power. The species we today keep as pets have often had, and still have, their usefulness. There are numerous examples where these have managed to establish viable populations in the wild. In Norway we have for example feral *Felis catus*. In the past, there were also wild *Canis lupus* familiaris in Finnmark (Bevanger 2005). *Oryctolagus cuniculus* is well known to roam and have managed to maintain populations for some considerable time, even at such a cold place as Røros where they became naturalised during the Second World War and survived at least until the 1960s. Aquarium fish such as *Carassius auritus* have been released and have managed to establish populations. In general, cleaning of aquariums is a source of both introduced animals and plants. *Elodea canadensis* may have first ended up in Norwegian nature via aquariums. Over 200 different species of invertebrates have been intentionally imported as terrarium animals, fodder, or for butterfly farming. These are mainly tropical and subtropical animals which have little chance of becoming established in Norway (e.g. Scorpiones).

Norwegian forestry has mainly used two of the native coniferous tree species, *Picea abies* and *Pinus sylvestris*, although attempts have been made to plant other alien species, some of which are in current use. Practically speaking, all species that have been attempted planted have produced seed, and many have spread to a lesser or greater degree outside plantations. Only 4–5 of these species are considered as problem species to any degree, yet the fact that they can alter the environment rather dramatically where they become established means that they can locally, and perhaps also regionally, cause considerable damage to biodiversity. Many of these have common origins. *Picea sitchensis* and *Tsuga heterophylla* originate from coastal areas of western North-America. These have spread along the west coast of Norway. *Pinus contorta* originates from inland and mountainous parts of western North-America. It has dispersed from plantations in many parts of Norway despite the fact that the cones had been assumed to be dependent on forest fires in order to release their seeds. *Larix decidua* and *Pinus mugo* originate from mountainous areas farther south in Europe. These have spread both in coastal, inland and mountainous parts of Norway. Norwegian forestry plantations have resulted in the establishment of relatively few expanding species. Still, those that do expand can result in structural changes in many habitats, first and foremost in coastal and heath areas.

The single largest source of deliberate introductions of alien species to Norway is from vascular plants used in gardens and parks, such as ornamental trees and bushes, perennials and annual flowers (Fremstad & Elven 1997a). Of the approximately 800 alien plant species that reproduce in Norwegian nature (Lid & Lid 2005), over 400 are from garden imports. This implies that roughly 25% of the total number of established alien species present in Norway is the result of one single, deliberate means of introduction. Garden plants have, as opposed to e.g. livestock, aquarium fish and terrarium animals, often been tested beforehand. It is

Box 11

Harmonia axyridis

Photo: Åslaug Viken

Harmonia axyridis has been deliberately introduced to a number of countries for biological control of animal pests on plants. The species originates from Asia, but has in the space of the past 25 years become the dominating ladybird species outdoors in the USA. Since 2001 it has also spread explosively in Europe. In Scandinavia, it was first found in Norway and Denmark in 2006, and in Sweden in 2007. The pattern of spread is summarised by Brown et al. (2008).

In Norway, applications were made to use *Harmonia axyridis* in biological control, but the species was not approved by the Norwegian Agricultural Inspection Service in 2001 on the basis of an impact/risk assessment from expert bodies. Even so, the species came in the back door into Norway, as a stowaway with imported plants (Staverløkk 2006). Updated status for the species in Norway shows mainly single records from different sites, apart form in Oslo with several finds within a relatively small area. The only places where the species has established itself (with eggs, larvae and pupae) are Oslo and Tvedestrand.

There is much to suggest that immigration by *Harmonia axyridis* can have dramatic ecological consequences. Due to its spreading and reproductive capabilities as well as its broad diet, it can effectively compete with native ladybirds and other aphid eaters. As it also eats larvae and other ladybirds, in addition to eggs and larvae of other insect species, it may pose a threat towards native insect populations. In autumn they often feed on ripe fruit to build up nutrient reserves for overwintering. This can lead to poisonous secretions being deposited in the fruit. *Harmonia axyridis* can therefore become a serious pest in orchards (Majerus et al. 2006).

mainly species that have been found to withstand the Norwegian climate that have been further cultivated. Most of these are also able to reproduce in gardens, either by fruiting or vegetatively. Garden plants are therefore often predisposed to a life in Norwegian nature.

Most of the alien garden plants come from grasslands, woodlands or mountains from other parts of the world, in particular from mountainous parts of central and southern Europe, Caucasus, Asiatic mountain ranges, and from forests and mountains in east-Asia and North America. Spread of vascular plants from gardens and parks to pastures and woodlands is therefore comparable to spread back into habitats with the same ecological characteristics as the habitats they originated in.

Spread of alien vascular plants from gardens mainly takes place in two different ways, by passive, animal- (usually bird-) or wind-assisted dispersal of seeds, fruits or spores, or else as garden waste (see Box 10). In the case of seed-producing garden plants, natural dispersal comes in addition to garden waste. Self-dispersal for those species which reproduce sexually or by cross-fertilisation requires at least two individuals in close proximity in order to found a population. For those species that reproduce asexually and in particular those that produce fruit without fertilisation (agamospermy), the situation is entirely different. These can establish populations from just a single individual, and are in a class of their own in terms of spreading within Norwegian nature. Examples of such include most species of *Cotoneaster* and *Sorbus*, and probably also *Amelanchier*. They are especially effective if their fruits are juicy and are spread by birds (see Box 16). It is perhaps a paradox that sexual reproduction and cross-fertilising, which facilitate evolution and adaptation, is at times more of a hinder than a help during establishment.

Biological control of agricultural pests is a wide-ranging business. In order to avoid or reduce the use of chemical herbicides, parasites or predators upon insects are often used (often Insecta and Acari). Typical examples are Ichneumonoidea, Coccinellidae and predatory Acari. New regulations were introduced in 2001 regarding the import of such species into Norway, which

Box 12

Some unintentional import vectors for vascular plants: ballast soil, grain and soya beans, seed and timber

Import of vascular plants has often occurred via specific vectors, with some variation over time. Therefore, differen plants have arrived here at different times and different places. Five of the vectors involved are ballast soil, grain, soya beans, seed and debarked timber. Prior to 1800, almost all traffic and transport to and from Norway was by sea. Fish, timber and mining products, and imported seed, grain, other food, textiles etc. was exported from Norway. Unintentional import of alien species mainly arose via agricultural products and by ship, when reloaded in harbours. However, we have limited information about vascular plants and in particular about alien species, before the 1820s. Of alien species that appeared in the first half of the 19th century, it seems that relatively few have arrived as stowaways with grain, relatively many with seed for improving Norwegian agriculture, and relatively few with ballast.

Ballast soil

When a ship travels without any cargo, then either the ballast room or ballast tanks must be filled with something for the vessel to achieve the correct weight, such that it can sail stably. From the end of the 18th century and up into the 20th century, i.e. the age of sailing ships, soil and stone were used as ballast although later, with boats being built of metal, then water was most often used. Early in the 19th century ballast soil and stone was dumped at sea before ships entered the timber harbours. There are few alien vascular plants documented or believed to have arrived with ballast in that period, although some are likely. An example is *Halerpestes cymbalaria* which first appeared in the harbour entrance to Fredrikstad and Sarpsborg past Hvaler (even though the species was first found by botanists as late as in 1916). During the latter half of the 19th century the picture changed drastically. To prevent build-up of sediments in shipping channels it was forbidden to dump ballast soil at sea, and permanent ballast sites were established on land. The herring town of Kristiansund was, as an example, for a large part built upon ballast soil from ships arriving from southern Europe to collect salted and dried fish. In the 1860s and 1870s around a hundred alien plant species were recorded in Kristiansund, many for the first, and sometimes only, time in Norway. Some of these have later become very aggressive in Norwegian nature, but that is probably due to introductions elsewhere. In Kristiansund it was too cold and damp for these southern European plants. Alien plant species established themselves more easily in the ballast harbours of Sørlandet and Sørøstlandet, both due to a better climate there and because timber was exported to west and mid- Europe whereas herring from Kristiansand tended to go to Portugal and the Mediterranean. This implies that ballast soil which arrived at harbours in the south came from areas not dislike the Norwegian. Use of ballast soil first ceased in the 1900s, with few exceptions before 1910, but the biological results are still strong in Norway. The importance of ballast soil on Norwegian flora is presented in Ouren (1968, 1978).

Grain

At the end of the 18th century and throughout most of the 19th imported grain was distributed around the country to be ground at village and farm mills. From the end of the 19th century and beginning of the 20th, larger and more central mills were built close to harbours and quays along the whole coast between Oslo and Trondheim. The main mills were situated in Oslo, Kristiansand, Stavanger, Bergen, Vaksdal, and Buvik by Trondheim, and these became central points of import for alien vascular plants. Also countless smaller mills, especially in Hordaland, contributed with many imports. Hundreds of alien plants arrive at mills and unloading harbours and started to spread from these numerous import points. Many such species are today widely distributed and a permanent feature of Norwegian nature, in some cases at completely different and more suitable places than where they were imported to. The ballast and grain-mill plant *Hordeum jubatum* arrived i.e. on the coast, but this is a plant preferring a continental climate (probably mainly coming with grain from the prairies in the USA and Canada), and it was first established properly when it reached the driest parts of the Otta Valley (Ottadalen) in Våga, Lom and Skjåk, rather a long way from the import harbours.

Photo: Oddvar Pedersen

Bunias orientalis (imported with grain)

Grain was brought in from different areas, often from Denmark and the Baltic before 1920, much from the Black Sea region (Ukraine and other places) around 1920, in the 1930s to some extent from North and South America, and after the Second World War mainly from USA and Canada. This development is connected with the modernisation of boats. Sailing ships made of wood were slower and more at risk in open waters (a cargo of grain could quickly sink a ship if it started to leak), whereas steam ships and diesel ships made of steel could transport grain over much greater distances. The various imports determined from which areas we mainly received alien plants. We have phases with "Baltic", "Russian" and "American" alien species, and even a little "Argentinian" phase. Introduction of alien plants associated with grain goes back to the 1960s and 1970s, mostly due to asphalting and tidying up around the mills and more mechanised transport of grain from ship to silo.

Soya beans

From around 1960 there was a new wave of alien plants from new areas, when one started to import soya beans on a grand scale for production of soya flour and soya oil, the latter for margarine. Beside the two largest soya factories, in Fredrikstad and in Larvik, between 50 and 100 alien species that have arrived specifically with soya beans were recorded there between 1960 and 2000, amongst these five species of *Ipomoea* (Grøstad et al. 2002). Soya beans were mainly imported from USA and from areas with a much warmer climate than in Norway. These were therefore not hardy, and probably none have become established in Norwegian nature. They have however been found almost annually up to the 2000s, something which illustrates the import pressure.

Seed

For a long time attempts have been made to improve Norwegian agriculture by importing seed, also because it was often difficult to obtain ripe seed with good germination capabilities under Norwegian conditions. Import of seed probably began as early as the 18th century, and especially is the period from around 1840 to 1900 characterised by import of a number of alien plants as stowaways with seed. Examples of these include *Noccaea caerulescens* and *Campanula patula* and probably also a species as familiar as *Leucanthemum vulgare*. In the early years much of the seed originated from Denmark and Sweden, i.e. from areas with a flora not unlike our own. From the 1840s the composition of alien species indicated that much of the import came from mid- Europe, perhaps mainly from Germany. The seed was responsible for a marked increase in

new alien plants, of which many have become permanent and common e.g. *Potentilla thuringiaca*. Import of seed from Europe, especially from Germany, gained a competitor after 1945. After the Second World War the composition indicates that North American seed had made a strong entrance to the market, and many North American species started to appear, e.g. *Amsinckia micrantha*, now under strong expansion in Vestfold. Seed for reconstruction along roads and other construction sites often appears to have American origins and may have a very exotic element of alien species. By a road construction site in Lardal in Vestfold in the 1990s two species from South America were recorded, as well as one from South Africa, and numerous species from North America in addition to cosmopolites.

Timber

From being a pure exporter of timber before 1900, Norway became more of an importer of timber in the second half of the 20th century with a build-up of timber companies with international connections. A hundred or so alien plants are to date recorded beside timber companies in Sarpsborg (Borregaard), Moss (Peterson), Tofte in Hurum (Södra Cell), Sande (Sande Paper Mill) and other places. A provisional summary is given in Often et al. (2006). Timber is important from many different areas: from the Baltic and Russia, western Europe (such as Scotland), eastern North America, Brazil and other tropical areas. The selection of stowaways are equally varied; in the 1990s with many western European species, in the 2000s with many North American and some Russian; and now and then tropical – subtropical weeds which indicate that they have come from e.g. Brazil. A few tens of species have become established, more or less, although they have not managed to expand far from the place of import. One of those species that has exhibited periods of heavy reproduction and a large population is *Ulex europaeus* by Tofte. This is a thorny succession plant (gorse) which is characteristic in former grazing land and coastal heaths in the British Isles north to Scotland. Winters in the Hurum area are probably too cold for this species, but if it ends up in Sørvestlandet, then we can expect changes in habitat types. The future fate of timber stowaways is uncertain, but some will probably become well-established and perhaps also become problem species. Examples of such might be some of the over 10 alien blackberry *Rubus* species found at timber import places, all of which reproduce asexually, have a strong vegetative growth, and effective defence against all forms of predation.

Photo: Oddvar Pedersen

Ulex europaeus (imported with unbarked timber)

requires environmental impact assessments of the species whose use is applied for. A total of 5 of the 19 species that were applied for in 2001 were not approved. Three of these had, however, already been used in Norway prior to the new regulations (Tømmerås et al. 2002). *Harmonia axyridis* was not accepted for use in Norway and is an example of a species that has had huge ecological effects outside its natural range. Even so, the species has been documented in Norway in 2006 and has since arrived as a stowaway on numerous occasions. It is now considered to be established and spreading within Norway (see Box 11).

In the case of marine species, Norway imported both *Venerupis philippinarum* and *Crassostrea gigas* in the 1970s and 1980s in an attempt to cultivate them. These have not been recorded as having spread beyond the areas where they were cultivated, despite the fact that adult animals are still present at these sites. Import of living lobsters for human consumption has resulted in *Homarus americanus* gaining a foothold in Norway. It is still legal to import these animals, as long as they are not then released into the sea.

Unintentional introduction

Despite the fact that a large proportion of the alien species found in Norway is the result of intentional introduction, unintentional introduction is responsible for even more of our alien species. All forms of traffic and transport across national boundaries can spread species as stowaways, and the means of transport often determine the set of species introduced. In the case of vascular plants, for which we have reasonable good data – including historical data – it has been possible to document means of import (Fremstad & Elven 1997a), see Box 12 on import of vascular plants with ballast, cereals, soya beans, seeds and timber.

Import of timber has also significance regarding import of other organisms than vascular plants. This has, in particular, led to the introduction of alien insect species to the Norwegian fauna (Økland 2000, 2002, Økland et al. 2007). A Swedish survey showed that timber from southern Europe (Spain and France) contained 37 species of beetle not previously recorded in Sweden (Gillerfors 1988). One expects that more new species will be imported via this vector, and some of these are here treated as 'door knockers'. The bark beetle *Ips aminitis*, a close relative of *Ips typographus*, was first recorded in Norway in 2002 in a boat cargo with debarked spruce timber from Estonia. It has since been recorded in subsequent similar cargoes. So far, no reproducing populations have been found in Norway, although the species has been found overwintering on one occasion in a large temporary store for imported timber. *Ips aminitis* is a potentially harmful species in coniferous forests, especially of *Picea abies*. It is also found in Finland, where it has expanded its range since the Second World War.

Transport along road networks as well as railways is an important pathway for alien species. Road traffic into Norway is still along the same routes that have been used for hundreds of years (and the railway route has remained unchanged for over 100 years), such that overland transport has not resulted in marked periodical changes. In the same time period, however, there have been greater changes in shipping and traffic to mills. Our road and rail networks are linked to Sweden, as well as road connections with Finland and Russia (in other words links to the east rather than to the south), and spread of alien species into Norway along these routes is well documented, in particular along the railway as alien species are often concentrated at loading and unloading locations, i.e. stations. *Trifolium spadiceum*, *Campanula patula*, *Poa supina*, and *Arabidopsis suecica* regularly appear in Norway along paths, roads and railways from Sweden, this happens naturally along routes of entry which we ourselves have created.

A common trait for roads, as well as railways and ships, is that they have become "cleaner" now than they were 30-50 years ago. The use of containers has decreased the possibilities for introduction of alien species during loading, transport and unloading. The same applies to asphalting of most industrial and goods yards and harbours (the only exciting exception to this for naturalists are railway stations). As an example, not a single alien species has been recorded around the major car import depot in Drammen, where more or less every single Norwegian-owned Toyota car has been unloaded.

Import of ornamental plants, soil, fruit and vegetables from abroad has resulted in the introduction of a large number of alien species into Norway, not merely those that have been intentionally imported, but also stowaways. Some reoccur regularly, such as *Cardamine hirsute* and *Epilobium ciliatum*, whereas others are more sporadic. A long list of insect species and other invertebrates also arrive together with these plants, soil and plant debris (Ødegaard et al. 1999, Sæthre et al. 2010). Many of these species are generalists with great capabilities for self-dispersal, and which can relatively quickly become established in suitable habitats such as

Styela clava on a propeller.

compost heaps and waste disposal sites. Serious pests such as *Leptinotarsa decemlineata* have been found many times in Norway, although to date not outdoors. *Harmonia axyridis*, however, appears to have become rapidly established following the first discovery as a stowaway in 2006.

Very small organisms such as Nematoda and Acari will often lead an anonymous existence for many years following arrival. *Globodera rostochiensis* has almost certainly been brought into the country by seafarers along with *Solanum tuberosum* or soil. It was first found in Norway in 1955, and today occurs in all counties as far north as Nord-Trøndelag (Sundheim et al. 1994). Gastropoda is a group of animals that present many challenges, both in Norway as well as abroad. There is a general lack of knowledge regarding distribution and the occurrence of snail species. These are animals with poor abilities of self-dispersal, and the reason as to why so many species of snail have managed to become established, in Norway as well as other countries, is due to transport of soil and plants, which are the very haunts, egg-laying sites and food source for snails. The most discussed species in recent years is *Arion vulgaris* which has spread extremely rapidly (Bevanger 2005, Weidema 2006). The same is true for *Lilioceris lilii* which, since first imported in the 1960s, has spread with garden lilies (Liliaceae) along the whole coast as far north as Trøndelag. The alien lily species *Lilium martagon*, which is a frequent and attractive plant that had managed to escape its enemies by naturalising in a new region (Fennoscandia), is now heavy grazed upon by *Lilioceris lilii* in both gardens and the wild.

Several new species in Norwegian waters have a background from ballast water. Ballast water is filled where goods are unloaded, and this water may contain a number of living, marine species which are then transported from one side of the world to the other in a short space of time. When the boat reloads with a new cargo, the ballast tanks are emptied, and any species present are released (Carlton 1985, Norwegian Directorate for Nature Management 2001). The International Maritime Organisation (IMO) has drawn up a convention on release of ballast water. This was agreed upon in February 2004, and Norway has ratified and practices this (Ministry of the Environment 2006). This agreement obliges all signatory nations to work towards all ballast water being cleaned before release within 2016. By 2012, all new ships must clean ballast water they carry and, according to the convention, by 2016 all ships must change ballast water on the open sea. In addition, ships bring alien organisms attached to the hull. The development of effective anti-fouling substances has resulted in an alleviation of the problem on modern boats, although following the ban on use of tributyltin (TBT) as an anti-fouling substance, the problem is likely to again increase as the new substances are not as effective. In Norway we have, however, as the result of increased offshore operations, a large increase in slow-moving vessels such as barges, rigs and cranes. Little attention has been paid as to how such vessels might contribute towards import of new species. Yachts and smaller fishing boats may also be important vectors for secondary spread of species which are introduced to southern parts of Europe. Alien species can grow on the hull, propellers (see photo) and anchor chain, or can survive in piles of fishing nets on deck.

Unintentional introduction of alien species can occur in many ways. In principle, all organic material and water may bring with it alien species, yet species can also arrive via various means of transport or packaging. This is something which is most apparent through trade of living seafood. There are therefore particular challenges associated with identifying and regulating those activities which contribute to new species arriving into the country. In addition, deliberate introductions can also lead to unintentional introduction of species arriving together as stowaways, even though regulations and laws exist to prevent such additions to fauna and flora. Technological developments have resulted in many forms of transport becoming cleaner, in particular the container system and automated loading and unloading facilities, although this has happened due to economic rather than environmental motivations. Some regulations are also probably effective, such as those for ballast water, although there are virtually no regulations on import of, for example, plants, garden materials and timber. We cannot avoid introduction of alien species as long as we have communication and trade across national boundaries.

Secondary spread of alien species from neighbouring areas

When an alien species first becomes established, and starts to spread, then this is often by self-dispersal rather than aided by human vectors (e.g. naturalised berry-bushes and their dispersal aided by birds). In many cases initial introduction and establishment have taken place in neighbouring countries, and the spread into Norway has taken place without any help from man. Self-dispersal often has a completely different pattern compared to deliberate or accidental introduction. Introduction normally leads to a number of defined points of establishment, often determined by the introduction vector or by coincidences (Ødegaard & Tømmerås 2000), whereas self-dispersal is often much more diffuse.

Spontaneous spread from neighbouring areas is often as an advancing front, such as in the case of *Paralithodes camtschatica*, *Nyctereutes procyonoides*, and many vascular plants from the east, or for example for *Streptopelia decaocto*. *Streptopelia decaocto* is not an alien species in Norway, but has been used as a model species during development of methods. *Streptopelia decaocto* began to rapidly expand its range northwards in Europe during the 1920s, reached Sweden in 1949, Norway in 1953, and is today widely distributed as far north as beyond the Arctic Circle. Such spontaneous, secondary spread is extremely difficult to limit as these species are often naturalised before they reach Norway, such that they use the same means of dispersal as native species. An example is the vascular plant *Cotola coronopifolia*, see Box 13.

What happens when species arrive in new environments?

There is a large and persistent – although not quantified – introduction pressure by alien species upon Norwegian nature. An interesting study has been carried out on Svalbard, on possible introduction of vascular plants by travellers. The great movements of people today result in alien species accompanying them in removal loads and baggage, in pockets, trouser turn-ups and on shoe soles. Svalbard today

Box 13

Repeated secondary spreading into Norway: *Cotula coronopifolia*

Cotula coronopifolia is a small, annual plant in the Compositae family from South Africa which has spread along tidal meadows and wetlands in Europe. It was imported into Europe, probably as a decorative plant, and was known to be naturalised in England in the 1860s. It first appeared in Norway in 1875 on gravel banks at the mouth of the river Lærdalselva, a long way within the Sognefjorden. Introduction by ballast has been suggested, although that is rather unlikely. Lærdalsøyra and Sogn in general did not have any known ballast harbours and not a single ballast plant was known from the 19th century. It probably arrived via spontaneous spreading by birds from a neighbouring area, most probably from Great Britain.
The species has largely disappeared from Lærdal due to development (last seen in the 1990s), although it has appeared at a new and, in terms of possibilities of spreading, interesting place. A large population has appeared in the littoral zone at Nøtterøy, first observed in 2011, undoubtedly as the result of spontaneous spreading. We can also guess that the source of spreading and the vector for spreading is birds. The species is known only from a few permanent Nordic occurrences. The closest of these is a huge occurrence at Thyborøn in Jutland, less than 300 km from Nøtterøy, and in an area which is much used by birds during migration.

Photo: Eli Fremstad

Cotula coronopifolia

has eight established alien species, all introduced either with animal fodder to the Russian settlements at Barentsburg and Pyramiden, or as seed along roads within settlements, including Longyearbyen. Ware et al. (2011) found that every incoming traveller to Svalbard brought with them an average of 3.9 seeds on footwear, which equates to an annual pressure into Svalbard of 270 000 seeds. They also found that 26 % of these seeds could germinate under normal conditions on Svalbard, which gives annually over 70 000 potential germinations of alien vascular plants on Svalbard. This applies mainly to tourists who do not move around much in nature. Researchers, however, brought in on average 50 % more seed than tourists, due to the fact that they walk around more in the countryside. At present this is not a great threat on Svalbard, owing to the fact that almost all the recorded alien species were from places with an unsuitable climate. They will hardly survive a winter under today's conditions, although all that may change. There is no reason to believe that people who travel on hunting and fishing trips to Canada, Alaska or Siberia bring back fewer seeds from abroad back to Norway (or Norwegian seed taken abroad), or that these seeds have less chance of germinating than those brought from warmer climates with tourists to Svalbard. Outdoor and wilderness tourism may prove to be an important source of introduction of alien species into Norway.

Box 14

Dormant periods, changes in habitat types and possible adaptation: *Acer pseudoplatanus*

It can take a long time before an alien species causes changes to the ecosystem it was introduced into. Often one observes a long period of dormancy in introduced species from initial introduction into the new environment until the species begins to spread. A dormancy period may have several causes: genetic adaptation to the new environment (evolution), satisfaction of habitat requirements (whether it be to reach the right habitat or that changes in the landscape result in habitat requirements being met) and to sufficient build up in numbers (the species must create a strong population before spreading accelerates).

Acer pseudoplatanus was introduced to Norway as a park tree many times as early as the 18th century (Fremstad & Elven 1996). The first report of the species being naturalised is from 1896, i.e. 150 years after the first assumed introduction. In 1900 the species began to expand and by 1950 it had reached Lofoten. The species has in recent years vastly expanded in Norway, mainly by displacement, and has in places become very common and locally become the dominant tree species, having displaced many of the native species.

The expansion after 1950 is probably due to changes in the rural landscape. *Acer pseudoplatanus* is a very effective successive plant where old semi-natural sites and grazing land are abandoned. The species also enters full-grown woodland, although to a lesser degree and here it is rarely dominating. A special characteristic suggests that genetic adaptions to the new environment in the country may have taken place. Compared to mid- Europe, from where it originates *Acer pseudoplatanus* has a much shorter generation length than here in Norway. Here it begins to flower at the age of 15 (Haxthow 1988), whereas 30 years is normal farther south.

The success of *Acer pseudoplatanus* in Norwegian nature is thus due to at least four circumstances: early import, import to many places across large parts of the country as a park tree (many "core points"), a shortening of generation length, and man-made changes in the landscape which promote the species.

Photo: Eli Fremstad

Acer pseudoplatanus

For vascular plants, alien species which are recorded in Norway, but which are not found with reproductive populations, make up almost as many as those that are found reproducing or are believed to be able to reproduce in the near future (about 850 species in each group). In addition, it is likely that only a small proportion of those species that arrive here as casual guests and at random sites are observed and recorded. Those that arrive regularly, as well as those that rarely arrive yet which establish themselves, become recorded sooner or later. A general global estimate is that about 10% of alien species manage to become established and that 10% of these become problem species ("Rules of ten", Williamson 1996). These provisional figures are in agreement for vascular plants in Norway (even though Fremstad 2005 estimated a somewhat lower figure), although the proportions may vary both geographically as well as between species groups and are not universal (Lockwood et al. 2007).

The majority of such casual guests naturally have no chance of establishing themselves in Norwegian nature, either under current or expected climatic conditions. The following species, all of which have been found on many occasions, will hardly become a permanent part of the Norwegian flora in our own or the next generation's lives: *Phoenix dactylifera*, various *Citrus* species, *Actinidia deliciosa*, *Citrullus lanatus*, *Cucurbita pepo*, and *Eucalyptus*. This is also the case for a number of insect species which are imported more or less accidentally, e.g. wood-dwelling species with larva in imported tropical timber products, or species that are accidentally brought in with imported fruit and foodstuffs from other climate zones e.g. tropical cockroaches. Most individuals die relatively quickly in new environments as their biology and habitat requirements are not adapted to the conditions where they arrive, and because native species and better-adapted species often out-compete newcomers (deVos & Petrides 1967, Veltman et al. 1996, Williamson 1996). Three aspects worthy of consideration applied to newcomers (whether alien or native) are establishment, adaptation and spread.

Establishment and adaptation

In order that a species can become established in Norway, it must build up a viable population. Criteria for such a viable population are outlined in the chapter "Methods and set of criteria" and contain the elements of population size, growth rate (annual increase), demographic variance (how much intrinsic variation a population has between generations), and environmental variance (how much the environment affects number of individuals between generations). A general problem is that long-term data series including demographic data are only available for a very few alien species. In general one can, however, say that either a species cannot manage to establish itself, or else it can quickly establish a viable population. We have few examples where species have been present with precarious population levels over a long period of time. When and how an alien species becomes an expansive problem species has been much discussed (Kowarik 1995).

If the species has potential to become established in Norway, the likelihood increases for that to happen with increased propagule pressure, which is defined as the frequency of introductions and number of individuals per introduction (Lockwood et al. 2005, Colautti et al. 2006, cf. Perrings et al. 2002). *Sturnus vulgaris* first became established in the USA in 1895, after eight previous introduction attempts (Lever 1987), *Ovibos moschatus* established itself in Norway following the third introduction attempt. There are countless similar examples, both among animals and plants (Sax & Brown 2000). The number of individuals introduced to each site, their age and sex ratio, distribution, and environmental events, are all factors determining whether an introduction is successful or not (Gilpin & Soulé 1986, Lande 1988, Mack 1995). For most species which reproduce sexually, a minimum population density is required in order to be effective. A small initial population, such as the result of limited introduction or immigration of few individuals (or many individuals around several sites), may require long time before reaching a critical population density allowing effective establishment. This limitation is particularly strong for little mobile organisms such as vascular plants, mosses, many invertebrates, and those that cannot, or only within a limited distance can, search for a partner. A major reason as to why relatively few introductions of vascular plants are successful, which are reckoned as being climatically adapted, may be just this. Mass import of individuals (seeds) or mass spreading from gardens is relatively rare.

Another limitation with casual, unintentional introductions is that they only exceptionally end up at a suitable dwelling site. The number of introductions may be decisive as to whether a species ever finds a suitable site and can start reproduction and establishment. Here, marine organisms are often the exception, as alien species often come from similar environments and are often released in large numbers. This applies

particularly to species which are transported via international shipping. Large harbours are often situated by river courses with reduced water salinity and where natural biodiversity is low. Species that can be transferred by ballast water, or found growing on ship hulls, can very probably find areas with similar environmental conditions as their place of origin, and where at the same time competition from native species is low. In northern Europe, the number of alien species in harbours and brackish waters is considerably higher than in open coastal waters (Reise et al. 1999, Paavola et al. 2005). Many species have also followed as stowaways during import of cultivated organisms such as oysters (Ostreidae) (Reise et al. 1999). Areas where oysters survive often provide suitable conditions for accompanying species.

The chance that deliberate introductions lead to establishment is naturally enough more likely than through accidental introduction. This is because deliberate introductions have as a starting point species which one believes have a good chance of survival (Lonsdale 1994, Smith et al. 1999), and that enough individuals are provided within a given area such that a population can quickly be founded. Species which one wishes to introduce, are often released on several occasions (Enserink 1999), something which makes the search for suitable habitats which accidentally introduced species need undergo superfluous.

An important element, which we have little understanding of at present, is the time lag. Many alien species, perhaps the majority, have a time lag before they begin to really spread. There are several possible explanations for such time lags. One possible explanation is that the population requires a period to build up to a critical size before effective reproduction. Once a population starts to reproduce in a big way there is a greater chance that descendants find suitable habitats. A further situation which is emphasised for the terrestrial environment is changes in land use. The relatively recent expansion of *Acer pseudoplatanus* is clearly related to a reduction in pasture and heavy grazing of outlying fields (see Box 14). Overgrowing of abandoned semi-natural sites has been a characteristic of changes in the Norwegian landscape since around 1960, and *Acer pseudoplatanus* has shown itself to be an effective regrowth species (Fremstad & Elven 1996). Changes in land use may also provide corridors connecting formerly isolated habitats. Genetic factors are a third explanation for time lags.

Time lags may be due to an alien species requiring some time to adapt to new conditions. Adaptation means changes within the alien species which occur after its arrival and allow it to better function in its new environment. Two important elements are changes in DNA, i.e. by mutations and their spread within the population, and epigenetic changes i.e. that the gene expression changes (genes are switched on or off) without changes to the structure of the DNA. Adaptation by genetic changes occurs naturally only if a species reproduces, and only if the improved characteristics are spread in the population. We can expect better and faster adaptation in cross-fertilising species than in self-fertilising species. Still less adaptation, if any, will be found in species which reproduce asexually or by fragmentation. As the great majority of alien species in Norway are from warmer places, genetic adaptations towards climate and light conditions might explain time lags. Genetic adaptation is however a lengthy process which is also dependent upon generation length. Species with one or more generations per year can naturally adapt much faster than large mammals that are first sexually mature after several years, not to mention the oak tree *Quercus* which may not begin to reproduce until it is 50–100 years old. Change by mutation is therefore a slow process especially if the mutation needs to be spread throughout a large population before having any measurable adaptation effect. It is doubtful whether a few tens of generations are enough, and this is a typical figure for time lags.

Many trees need a long time before they first produce seed, in addition seeding/fruiting and germination can only happen under certain climatic or environmental conditions that occur with regular or irregular intervals (McWilliams & Arnold 1998). A reconstruction of the historical development of 184 introduced trees and bushes to Germany (Kowarik 1995) revealed that only 6% of these species had spread in the course of 50 years after first arrival, 25% had a time lag of up to 100 years, 51% of up to 200 years, 14% of up to 300 years, and 4% over 300 years. On average, trees had a time lag of 170 years, whereas the corresponding figure for bushes was 131 years. This difference points towards adaptation, although 100-300 years is still only a few generations, especially for trees, and it is unknown as to whether genetic changes in DNA have taken place.

Acer pseudoplatanus was introduced into Norway as an ornamental tree in parks on many occasions from around the middle of the 18th century. This may have contributed to genetic adaptations through greater genetic variation. The first reports of naturalisation are

from around 1900 (Fremstad & Elven 1996), roughly 150 years after the first documented introduction, and the species expanded rapidly after 1960. Both adaptation and land use may be the cause, although a difference in generation length has been found between *Acer pseudoplatanus* as native species in Central Europe and as naturalised species in Norway. The species matures in Central Europe at around 30 years old. In Norway it matures at 15 years old and has therefore a considerably shorter generation length, something which results in a more rapid population growth (Haxthow 1988). It is difficult to find any other explanation for this other than genetic or, more likely, epigenetic changes (see Box 14).

Adaptation by epigenetic change is much faster and can affect all or almost all of an incoming population immediately. It is therefore plausible that the time lags which are observed are more often due to epigenetic changes rather than changes in DNA.

An important factor in vascular plants, and perhaps also for invertebrates, is light levels. Most of the alien vascular plants that arrive in Norway are adapted to longer nights and shorter days during the growing season than they experience in Norway. In the case of vascular plants, length of night and day are normally crucial for a number of vital processes: end of winter hibernation, initialising of flowering, and building up of resistance to winter during the autumn. A large number of vascular plants first start to flower very late in Norway, even though they germinate or shoot in spring. This applies especially to newcomers, whereas alien species which have been present here for some time often follow the same seasonal pattern as for native species. Such delayed development is probably mainly due to a reaction to day length. They are either long-day plants that do not start to flower until day length is less than 14–12 hours, or else long-night plants that require at least 8–10 hours of darkness. This implies that flowering is inhibited in spring and early summer in Norway, with short nights and long days, but is stimulated from August onwards. One has feared that *Ambrosia artemesiifolia* might start to reproduce in Norway. This is a North American species, which is often imported in bird seed, and probably germinates hundreds of times each year. It is known as one of the worst irritants for people with pollen allergy. Today, it does not normally flower in Norway until August/September at the earliest, sheds very little pollen and does not produce fruit. An extended season, which is expected based upon climate scenarios, may allow its reproduction in Norway, but would not change the light conditions that determine its late flowering. Therefore, the species does not need to represent a pollen problem, even if it should start to reproduce. However, adaptation to new amounts of daylight can occur quickly. A study of the North American weed *Xanthium strumarium*, which is closely related to *Ambrosia artemesiifolia*, found an almost perfect relationship between required night length and latitude from southern USA to Canada, and also found an adaptation to the particularly long nights in Hawaii, where the species has only recently been introduced (Ray & Alexander 1966). This species flowers in Norway, north of the latitude that is today's limit in North America, although so late that to date no ripe fruit have been found. As long as it does not reproduce, there is no risk of it adapting to conditions in Norway, although we assume that variation in requirements of night length may in this species be epigenetic, rather than genetic.

Many introduced vascular plants begin to expand almost immediately (such as *Senecio inaequidens* did in Norway), although amongst vascular plants there are also several examples of annual and biannual species which have had long time lags before they began to seriously spread: for example 25 years from 1874 to ca. 1900 for *Noccaea caerulescens*, and 35 years from 1865 to 1900 for *Lepidotheca suaveolens*, and over 50 years for some species (i.e. more than 50 generations) such as for *Veronica persica* with an approximately 90 year time lag from 1874 to 1960, and in the case of *Veronica peregrina* a time lag of 110 years between 1880 to 1990. No external ecological reasons are known.

Time lags and potential adaptations are also typical among herbivorous insects associated with alien plant species. *Sambucus racemosa* was introduced into Scandinavia as a garden plant 200 years ago, and is now naturalised as far north as Namdalen (Fremstad & Elven 1998), after a time lag of around 50 years from 1848 to 1900. The beetle *Heterhelus scutellaris*, which lives exclusively upon this plant, was first observed in Norway in 1979, after having spread successively and relatively slowly from Denmark and through Sweden over a period of about 60 years (Ottesen & Kvamme 1985). It expanded rapidly in Norway and after 30 years is now common on *Sambucus racemosa* throughout the whole of the plant's range in the country. The insect's time lag was probably spent outside Norway, before it arrived by spontaneous dispersal.

Variations in conditions for and ability to establish, adapt and disperse determine how successful an

alien species will be at naturalising, together with the local environmental conditions and competition it meets. The species may expand immediately, have a time lag, or fail completely. Time lags can be divided into three main categories (Crooks & Soulé 1999). Some species have an inherent time lag related population growth and dispersal. The time lag can also be induced by environmental factors and first cease when these factors change e.g. changes in land use affecting Acer pseudoplatanus (Box 14), or they can cease or become extended by climate change, the disappearance or arrival of vectors for dispersal and change in competition (either intra- or inter-specific). A third type of time lag can be related to genetic or epigenetic adaptations and may require many (genetic) or few (epigenetic) generations before a change that is favourable for the species has become widespread enough in the population to have an effect. If an alien species has a genotype adapted to a particular environmental condition, it will be "imprisoned" in a restricted area until eventual genetic changes occur such that it can survive and reproduce under other environmental conditions (Crooks & Soulé 1999). This is probably one reason that ecologically less specialised species are often the most effective invasive species. These are often species that have varied genotypes which allow them to live and grow in a wide range of environmental conditions (Baker 1965, Lynch 1984).

Establishment is the most critical phase for a newcomer. The species must find a place and compete for nutrients, it must avoid predation, it must survive climatic variation (annual seasons), and if it is not asexual or self-fertile, must find a partner in order to reproduce. The majority of newcomers will not succeed. Good data is available for vascular plants, where less than 25% of recorded alien species established a reproducing population. Even for alien species where humans maintains large, reproducing populations for a long period of time – livestock, cultivated plants, farmed animals and biological control – there are only a few which have become invasive. As an example, various cereals (annuals) have been grown in Norway for thousands of years, without ever having been found with viable reproducing populations in any habitat. In the case of most cultivated species the reason is probably that breed improvement has made the species well-suited for cultivation, but less suited in the wild. There are, however, many examples of such cultivated species becoming invasive species elsewhere in the world (Simberloff 1981, 1992, Simberloff & Stiling 1996, Louda et al. 1997, 1998, 2003, Louda 1999, Stiling & Simberloff 1999).

Spread

An overview over all the various vectors which spread unwanted, alien species presents great challenges. Spread occurs every single day and throughout the year, both in water, on land and in the air. It is assumed that tens of thousands of species are constantly on the move (Carlton & Ruiz 2004), and this estimate is probably too low. In Norway alone, at the edge of the habitable part of the world, this applies to perhaps a couple of thousand species (of which almost one thousand are vascular plants). In reality almost every human activity, both across national boundaries as well as within, spreads species to new areas, whether intentional or unintentional.

The vectors that cause spread within biogeograhical regions may, or may not, be the same which are responsible for spread between one region and another. Large proportion of our alien species have arrived in Norway either deliberately or as stowaways with goods, transport or other means, very often from other biogeographical regions. In the case of vascular plants and insects import with cereals, grass seed, bird seed, vegetables and vegetable seed, soya beans, ballast soil, debarked timber and other vectors are the main sources aside from intentional import of utility animals and ornamental species (Fremstad & Elven 1997a, Sæthre et al. 2010). Their further spread within the country has almost always occurred with the aid of other vectors: self-dispersal either aided by wind or animals (including ingestion for those that tolerate the digestive system, otherwise on feet or feathers), via means of transport, and additionally for vascular plants from garden waste. There is not a single documented case of an alien vascular plant having been spread between sites within the country via ballast soil, soya beans or timber, and hardly any with cereals. Import vectors are often rather different from the local dispersal vectors. This entails that species must possess the ability to readjust between import vector(s) and the local dispersal vector(s) if introduction is to be successful. A partial explanation of time lags may also be that a species requires time to find (and perhaps must also adapt to) a particular vector in order to disperse within the country.

This restriction does not apply to more mobile animals, at least not to any great degree, nor to many marine organisms, nor to alien species that spread spontaneously from neighbouring areas. These arrive more or less on a regular basis and spread within the country with the aid of the same vectors that brought them to the country boundaries. The pattern, both

Box 15

The trouble with *Heracleum*

Within the genus *Heracleum* we have (at least) three alien species in Norway. The two largest, *H. persicum* and *H. mantegazzianum*, are relatively recent newcomers. The third has 2 races: *H. sphondylium* ssp. *sibiricum* which is probably alien although present from before year 1800, and *H. sphondylium* ssp. *sphondilium* which is considered as being native (cf. R. Elven in Lid & Lid 2005). Both *H. persicum* and *H. mantegazzianum* were deliberately imported to Norway as decorative plants: *H. persicum* first in the 1830s, and *H. mantegazzianum* probably at the end of the 19th century (Fremstad & Elven 2006). *H. persicum* and *H. mantegazzianum* are among the most problematic alien plants in Norway (see NBIC's fact sheet). H. persicum is particularly well-established in northern Norway and in Trøndelag, whereas *H. mantegazzianum* to date has most occurrences in southern Norway and a few places in mid-Norway. Both species are spreading rapidly and form dense stands where nothing else can grow, amongst other reasons because they secrete substances which hinder germination and growth in other species. In addition to displacing other plants, both species are harmful to health. Prolonged contact with the hairy leaves and stems results in oversensitivity to light, and one develops sores which are difficult to heal.

Photo: Eli Fremstad

Heracleum mantegazzianum

Much less attention has been directed towards *Myrrhis odorata* which probably has a long history in Norway as a medicinal and herbal plant (see NBIC's fact sheet). In mid-Norway in particular, it has become more common. *Myrrhis odorata* invades meadows and grazing land which are no longer managed, and along roadsides and woodland edges. It can form extensive populations and out-compete other species. The species has gained a "renaissance" as an herb and is grown in many gardens, something which increases the chance of further spread.

in terms of first arrival and establishment and further dispersal, is often radically different for different groups of species. One could safely predict that *Nyctereutes procyonoides* would appear along the boundaries with Russia, Finland and Sweden and that *Paralithodes camtschatica* would first appear in east-Finnmark; yet no-one could predict that *Heracleum persicum* would first turn up in Alta (Box 15), the west European species *Ranunculus hederaceus* at the mouth of the river Nidelva in Trondheim, or the South African *Cotula coronipofolia* at Lærdalsøyra (see Box 13). Most could also predict that both *Paralithodes camtschatica* and *Nyctereutes procyonoides* would continue to spread until they reach a biological boundary, unless they were to be controlled. No-one could predict that *Heracleum persicum* would become a widespread problem species, or that *Ranunculus hederaceus* and *Cotula coronipofolia* would die out after ca. 120 years in Norway (the former survived in Norway between ca. 1825-1946, the latter 1875-1955). Nor could anyone predict that *Cotula coronipofolia* would reappear with a new population in Vestfold in 2011. The pattern of spread of such species is almost completely unpredictable.

Why do some species become a problem?

In summary, a problem species often has one or more of the following characteristics:

- Good ability to disperse, or their spread is greatly enhanced by human activity

- Good ability to adapt, either to a broad ecological niche or to a restricted, more common niche
- Large reproductive potential, either sexually, asexually or by fragmentation
- Opportunists that can exploit vacant niches in a changing landscape or a landscape which is poor in native species for historical or geographical (in terms of isolation) reasons
- May be subject to restrictions in its native area which are absent or are weakened in the areas they arrive at

We will deal with the last point first. In their native area, alien species that have become a problem here with us, have usually lived in balance with competitors, predators, parasites or hosts, or may have been handicapped by a lack of resources e.g. that a host has become resistant in the case of parasites. If they can be spread over great distances, they may avoid the same restrictions that were present in their original range. One example named above is *Lilium martagon* which escaped the beetle *Liliocerus lilii* until it was introduced to Norway in the 1960s. This phenomenon is variously described as "release from constraints" (e.g. in Sax & Brown 2000) or as "enemy release" (e.g. in Keane & Crawley 2002). We prefer the first alternative, because it covers more than the second, and we will continue to use this term. The most extreme cases of this phenomenon are parasites which are transported to new areas by new hosts, and where the new hosts have not built up a resistance which the original hosts have. We name three examples below. The phenomenon also includes being able to avoid parasites, predators, herbivores and competitors. Estimates have been made which show that alien species can avoid 75% or more of the parasites and pathogens they have in their original range (Torchin & Mitchell 2004). There are no such studies from Norway, although in the case of vascular plants "release from constraints" seems to be a reasonable explanation of their success, which is much greater than they manage in their country of origin, e.g. *Reynoutria* spp. and *Solidago canadensis*.

Every single new species entering an area which is already occupied by other species will lead to biological changes to a varying degree. It may exploit resources in a different way to those species already present, it may exploit some of the resources which no others have exploited, or as is often the case compete with species already present for resources. Much research has been carried out as to what enables an invasive species to become so successful, and it is already over 50 years since Elton (1958) looked at this problem in a wider ecological perspective. Some of the relationships are rather obvious. Species with a large dispersal capability have an advantage, as have species with a wide ecological niche. Species which combine both traits are particularly successful. These species are also often widely distributed within their original range. But there are also exceptions. Some species with very poor natural dispersal ability, restricted niche, and a small natural distributional range have become serious problem species due to human activity, e.g. *Reynoutria japonica*, as well as most weeds in towns and semi-natural sites. Invading species are in addition often tolerant of climate, predation, competition and pathogens (Baker 1965, Forcella & Wood 1984, Crawley 1987, Rejmánek 1996). Species such as *Elodea canadensis* and *Solidago canadensis* behave completely differently (and are less problematic) in their native North America, compared to in Europe. Our unproblematic European species *Alliaria petiolaris*, and the equally unproblematic *Lythrum salicaria* have caused considerable economic damage in North America, something which was impossible to predict based on these species' behaviour and characteristics at home in Europe. The agricultural weeds and livestock that had developed in Europe and west-Asia through perhaps 9 000 years, and which have not caused damage in Europe, resulted in a catastrophe for native vegetation when they followed Europeans and agriculture to North America, Argentina, Chile, South Africa and, not least, to Australia. What were the causes of this?

The characteristics of the place the species arrive at introduction are just as important as the characteristics of the species itself. Two situations stand out. Particularly vulnerable are places where the natural environment has been or is in a state of major change as the result of human activity, e.g. as a result of extensive agriculture and grazing, timber felling, pollution, or from selective hunting and fishing with extensive killing of native animals. These types of encroachment lead to a reduced stability in systems which thus become more susceptible to alien species. Immature or species-poor systems are also vulnerable. Studies within isolated groups of islands and island biogeography theory (MacArthur & Wilson 1967, Moulton & Pimm 1986, Losos & Ricklefs 2010) have shown that young and/or isolated systems have less resistance against alien species, probably because the number of potential niches is much more than the number of species present. The success of *Lupinus nootkatensis* on the young and volcanically unstable Iceland is a dramatic example. Other such examples can be found in the Canary Islands (many large islands relatively close to

the mainland), Madeira (smaller islands, and farther from the mainland), and the Azores (many islands, but isolated being in the mid-Atlantic). All of these islands are volcanic and relatively young, at most only a few million years old. Whilst the natural vegetation of the Canary Islands is relatively unaffected by alien species, the effects are greater on Madeira and catastrophic on the Azores. Norwegian flora and fauna are also new, mostly arising during the past 15 000 years, following the last ice age. Natural immigration and expansion are still taking place and have not yet reached saturation – examples of this are two tree species *Picea abies* and *Fraxinus excelsior* where invasives have not yet reached a limit. Therefore, we can expect that Norwegian nature still has several vacant niches which invasives can occupy.

Brackish environments are immature and species-poor systems. Low native species diversity and many vacant ecological niches have been pointed out as a reason as to why there are so many alien species in the Baltic (Paavola et al. 2005). Examples of alien species that have occupied "vacant" niches and become very common in the Baltic include *Amphibalanus improvises* on hard substrates in the upper parts of intertidal zone, *Potamopyrgus antipodarum* on very soft muddy substrates, and *Dreissena polymorpha* on stable surfaces in slightly saline and fresh waters.

More uncertain is the role of propagule pressure: how many individuals arrive, how often they arrive, how great an area they arrive to, and how effectively they reproduce. With a low propagule pressure it is probably very coincidental as to whether an alien species finds a suitable place to establish itself. With high and persistent propagule pressure the likelihood becomes greater to find one or more sites to become established. Gardens plants are a special case. These arrive in large quantities, are pre-adapted (see above), are spread both commercially as well as on a hobby basis wherever people live in the country, and are often thrown away along roads and shores where there are no people living. Garden plants have therefore a rather special opportunity to become established.

Species with a high reproduction potential are considered to be more likely to succeed than those with low reproduction potential. We need however to elaborate here on the meaning of the term "reproduction". By reproduction we here mean that new, physically separated individuals (offspring) are created, whether this occurs sexually, asexually or by fragments from the mother organism. Size of the offspring, regardless of how they came into being, is also of considerable importance. For example, parts of the rhizomes and shoots of vascular plants such as *Reynoutria japonica* and *Rosa rugosa* contain more nutrients for establishment than fruits or spores do. Of importance is also whether a species reproduces sexually or asexually and, in the case of sexual reproduction, whether the species is capable of self-fertilisation. If a species only reproduces sexually without the means of self-fertilising, at least two individuals need to arrive at almost the same point (within walking, flying or pollination distance), if it is to stand a chance to become established. Organisms with high reproductive potential are often invertebrates, fungi and lichens, and plants. Insects associated with manmade structures such as compost heaps are good examples of this. During the past 100 years, 34 new species of Coleoptera have become established in compost in Norway. Twelve of these have since spread into more natural habitats (Ødegaard 1999, Ødegaard & Tømmerås 2000). Some Vertebrata with a relatively high reproductive potential have, however, become established in Norway, too. *Neovison vison* (see Box 18) and *Branta canadensis* are examples of this. Both originate from parts of North America with the same climate and habitat types as here. This is probably a main element to explain why some become problem species. They rediscover a parallel to their original niche in the new area, at the same time that they can avoid some or all of their original competitors, predators, parasites etc.

The effects of alien species

In this current project, the effects of alien species have been grouped according to four categories:

- Structural changes in habitat types
- Direct interactions between alien species and native species
- Genetic effects upon native species
- Being a vector for parasites and pathogens

Structural changes in habitat

Alien species can affect the structure of native habitat types in many different ways. Effects on the whole community entail changes in species composition and habitat structure; in energy flow and food-chain dynamics (effects upon individual species are treated under species–species interactions below). It has been shown many times that alien species, particularly those that utilise a wide range of resources, contribute to a decline in native populations (Leavitt et al. 1994, Schindler et al. 2001). It is, however, difficult

to draw a line as to where a species makes a significant contribution to changes in ecological systems (Lockwood et al. 2007). There are numerous examples where alien species have become established without exhibiting a statistically provable effect upon native species (Williamson 1996). This is the rule rather than the exception. Regardless, it is very difficult to predict the effect on a habitat's structure, and on other parts of the biodiversity, when a new species enters an environment to which it is not native. Even where there is good information regarding a species biology and environmental requirements (Begon et al. 2006), it is virtually impossible to predict the effect in an unfamiliar environment. An alien species from European nemoral deciduous woodland, *Primula elatior*, has, as an example, become an extremely common species, but without posing any threat, on lawns and open grassland in Tromsø, in an environment quite unlike that it came from or is otherwise known to occur in. This may be because it has found its own niche unlike its original niche, in other words it has been "released from constraints". In a similar way, previous knowledge regarding *Heracleum persicum* from the tall-herb meadows in Caucasus and north-Iran would have been of little use in foreseeing its success and the damage it causes in abandoned semi-natural sites and as a weed in towns in northern Norway. In contrast, knowledge regarding *Paralithodes camtschatica* from its home range in the Pacific Ocean and Bering Sea, where it is the dominant among several species of large crabs, ought to have served as a warning as to what might happen in the north-Atlantic and the Barents Sea where such large crabs do not occur naturally.

If an alien species exploits resources more effectively, then native species may easily be outcompeted and in the worst case eradicated. An example of this is *Harmonia axyridis* which is used in biological control, but which has become established outdoors and has shown itself to be very effective in eating almost all insect larvae and other Coccinellidae species and becomes completely dominating (see Box 11). The ecological processes which are initiated by an effective invasive alien species are normally irreversible (Courchamp et al. 2003). It is therefore essential to take regulatory measures at an early stage. An alien species is however first noticed once there are many individuals, e.g. after a time lag where they are present rather randomly and in small numbers.

Some of the strongest effects arise where alien species alter the physical environment which is the foundation of ecosystems (known as "ecosystem engineers", Crooks 2002). When such species establish themselves and spread, then both the structure and the function of habitat types may change as their hydrology, nutrient cycles, soil, fire regimes etc. are altered (e.g. Ehrenfeld 2003). *Robinia pseudoacacia* is a North American tree in the Fabaceae family, with nitrogen fixating bacteria in the root nodules. No other tree species in Central and Northern European woods north of the Alps has such properties. Following invasion of *Robinia*, the amount of nitrogen in soil increases, and originally nitrogen-poor deciduous woods become nitrogen-rich (Rice et al. 2004). First, the understory vegetation changes from a species-rich herb and grass layer to a species-poor, homogenous mat of tall nitrogen plants, e.g. *Urtica dioica*. In the end, the original deciduous trees die out as they are unable to regenerate. In addition, an invasion of *Robinia* results in a 10–100 times increase in flow of nitrogen into streams (Haines in Sabo 2000), thereby leading to an eutrophication of nearby watercourses. *Robinia* is a fully developed ecosystem engineer, although it is not yet fully established in Norway. *Lupinus* spp. and perhaps also *Laburnum* probably have similar effects.

Some marine organisms also function as ecosystem engineers, such as *Crassostrea gigas*, which is capable of reshaping the environment for its own benefit, in this case from soft to hard substrate.

The abundance of alien species may be so substantial that it leads to a huge reduction in most of the native species and extinction of some, either locally or over a wider area. Globally, there are many species that are threatened with extinction due to alien species, and many are in danger of becoming so (Fuller 2000, Lockwood et al. 2007). This applies especially in vulnerable, isolated ecosystems. Many ecosystems, both on land, in the sea, and in fresh water, have become greatly altered or have deteriorated under the influence of alien species. An additional factor is the indirect effects of damage caused to ecosystems during control measures, such as from the use of chemicals.

Characteristic for ecosystems where alien species have taken over is that they are either geographically isolated (e.g. the Azores), historically young (e.g. Iceland), originally have a low species diversity, have a large element of man-made modifications, or a combination of all of these factors (Elton 1958, Frankell 1977, Fox & Fox 1986, Brown 1989, Case 1990, 1996, Burke & Grime 1996, Suarez et al. 1998). Areas without mammalian predators and herbivores and with few parasites and pathogens are particularly vulnerable (Elton 1958,

Box 16

What's wrong with garden bushes with nice fruits?

The main reasons for growing bushes in gardens are either because they have pretty flowers or fruits (often both), or as screening from roads and neighbours. At the same time they bring "a bit of the forest" into residential areas and towns, something which both people and birds are grateful for. Probably over a hundred different species are grown in Norway due to beautiful fruits, of which over 20 species of *Cotoneaster* alone.

Photo: Jeanette Brun

Berberis thunbergii

A few of the garden bushes are from Europe (e.g. *Sambacus rasemosa*). The majority are from eastern Asia and both western and eastern North-America e.g. *Amelanchier*, *Cotoneaster*, *Berberis thunbergii*, *Aronia* and *Lonicera* species. The tempting fruits are eaten by birds in autumn, and are spread with bird droppings in nearby woodland and scrub. The distance for a single dispersal "step" is often several kilometres, at times tens of kilometres, from garden to woodland. Norwegian woodland is poor in berry bushes compared to North America and eastern Asia, and also compared with mid- and southern Europe. This probably has historic reasons as these plants have not reached the country following the last ice age. In woodland these species can form a shrub layer which often did not previously exist, and the rich production of juicy fruits may attract birds away from native plants with such fruits. Therefore the total balance between birds and bird-dependent plants might be displaced away from native plants and over to alien. This is a hypothesis, yet not unlikely, and it can explain why many such bushes are considered as invasive in Norway, the Nordic countries and the Baltic States than they are in the rest of Europe. The density of fruit and nutritional benefits per fruit have been shown in several studies to determine which species fruit eating animals prefer (Herrera 1981, Hedge et al. 1991). In California the invasive alien species *Carpobrotus edulis* from South Africa, preferred by fruit gathering mammals, has displaced the native *C. chilensis* due to the former's much greater nutritional benefit per fruit gathered (Vila & D'Antonio 1998). The phenomena can be more general.

During a 10 minute mini-survey in spring 2012 at Tøyen in Oslo, two hedges of about 50 metres in length and with similar height and width were investigated; one hedge of Aronia (with juicy fruits) and one of *Carpinus betulus* (with wind-dispersed fruits, but kept too low to flower). The hedges were about 20 m apart from one another. In the *Carpinus betulus* hedge less than ten other individuals had sprouted, and all of these were of the wind-dispersed species *Ulmus glabra* and *Tilia cordata*. In the Aronia hedge there were almost as many plants of the same two species, but in addition also *Rosa* (ca. 10 plants), *Symphoricarpos albus* (one large plant), *Berberis thunbergii* (two plants), *Cotoneaster lucidum* (two plants), *and Ribes alpinum* (two plants). *Rosa*, *Symphoricarpos albus*, *Berberis thunbergii*, and *Ribes alpinum* are all bushes with juicy fruits spread by birds. When birds visit the *Aronia* hedge in autumn to obtain food, they clearly excrete a number of other fruits from bushes with juicy fruits.

Photo: Jeanette Brun

Cotoneaster bullatus

Ricklefs & Cox 1972, 1978, Newsome & Noble 1986). There were absolutely no herbivores on the Canary Islands until they became inhabited by man, and still very few until the arrival of the Spanish in the 14th century. The plant life of the islands was therefore practically devoid of thorny plants with the presence of thorn-less species of plants whose relatives in the Mediterranean had thorns, e.g. *Smilax* and *Asparagus*. The arrival of agriculture and extensive use of grazing animals was advantageous to introduced alien plants with thorns (e.g. *Agave americana*, and several species of *Opuntia*), more so than around the Mediterranean, where the effects of these animals were bad enough. Such vulnerability is more typical for island ecosystems and freshwater systems than for larger and more continuous marine and continental systems (Ebenhart 1988, Veitch & Clout 2001, Courchamp et al. 2003). This does not however imply that continental or sea areas are not vulnerable.

What about Norway? Even though the Norwegian fauna and flora are relatively young, mostly less than 15,000 years old, we have to date been spared for the dramatic effects we see in some island systems and in the cactus and agave deserts around the Mediterranean. This is probably not due to Norwegian nature being more resistant to alien species than other countries, but rather that fewer of the relevant alien species are well enough adapted to conditions on Norway. Most of the alien species come from lower latitudes, which means that species which are strongly invasive in Europe south of Scandinavia need not necessarily be a problem in Norway, at least not until they adapt to the northern climate, water temperature and light levels.

Those alien species that pose the greatest threat here, originate from ecosystems with a similar climate, they can enter our ecosystems with pre-adapted functions, and they can replace native species and disrupt the equilibrium in trophic systems. There are numerous examples of this. One of the most relevant is *Nyctereutes procyonoides*, whose natural range is in boreal East Asia. This species greatly reduces bird and amphibian populations and effectively competes against smaller native predators (NBIC's fact sheet). It reduces and removes specific trophic levels and leads to instability in ecosystems. In addition, it is an important carrier of the disease rabies. Another, yet less well-documented case, might be the very numerous garden bushes with succulent fruit (berries, stone fruits, etc.), see Box 16.

There are numerous examples from abroad where alien species have taken over and altered the structure of terrestrial, freshwater, and marine ecosystems. Such drastic changes at the ecosystem level can also occur in northerly areas. *Paralithodes camtschatica*, *Sargassum muticum*, and *Elodea canadensis* have had serious consequences for marine and freshwater environments in Norway, and much attention has been given to their consequences for resource exploitation (the first species) and for control (the two latter species). For more on *Elodea canadensis*, see Box 17.

There are to date hardly any examples where alien species have recently altered all or considerable parts of the landscape in Norway, even though this is well known from lower latitudes, as well as from former times also in Norway. There are many examples showing that they can influence the environment to such a degree that habitat types change character or disappear. Introduced animals, together with other manipulations of the landscape, have formerly altered large parts of Norway from woodland to scrubby heaths to grass-dominated grazing land.

Spread of alien trees from forestry and from gardens and parks may eventually change the composition and structure of woodlands currently dominated by native tree species. Extensive invasion of conifers into deciduous woodland systems leads to a change in seasonal light conditions (more shadow in spring and autumn), changes in leaf litter, and changes in the physical and chemical structure of the soil, which can tip the whole system over from one state to another (Ehrenfeld 2003). In this respect, however, the spread of *Picea sitchensis* probably has almost the same effect as the spread of *Picea abies* where it is planted and becomes naturalised outside its natural boundaries.

Naturalised bushes and herbs from gardens invade open and semi-open habitat types such as wasteland (roadsides, abandoned sites and others), abandoned semi-natural sites, and shallow-soil systems. The two latter groups of habitat types have a large element of competitively weak native species (invertebrates, fungi, vascular plants). These are subject to competition pressure from alien species when the rural landscape becomes overgrown. Overgrowing of former rural landscape does not always lead to the restoration of a former natural state, but to a species composition and to ecological functions which are strongly influenced by alien species. Since overgrowing affects large areas of former rural landscape in Norway, it is not unexpected to see, as an example, whole meadows totally dominated by *Heracleum persicum* in the north, or *Solidago canadensis* in the south. A number of alien vascular plants (amongst others those considered as being in the higher impact categories) have already led to negative effects on habitats, in

Box 17

Aquarium owners, fishermen and managers as vectors for dispersal in fresh water: *Elodea canadensis*

Photo: NIVA

Elodea canadensis

Elodea canadensis comes from North America and has, after spreading from there, shown itself to be a problem species in freshwaters in many places in northern areas. The species has been shown to have large ecological consequences in the freshwaters where it has spread to or has been introduced. It is a perennial water plant with 1 (-3) m long shoots which live immersed in water, up to a maximum depth of 8 m, but more usually in shallower water. It may be rooted or free-floating. After it was found at Østensjøvannet in Oslo in 1925 it has since spread to 60 or so lakes and 13 rivers (as of 1998) into Østlandet, to around Mjøsa and Nordre Land, along the coast to Rogaland and Sunnhordland where it is known from at least seven lakes, and recently from Nord-Trøndelag county (Fremstad 2011, 2012). It is considered to still be spreading. The species is associated in particular with ponds, small and large eutrophic or eutrophied waters, and slow-flowing waters. It spreads by torn-off pieces of shoot, helped by water, birds, or man (movement of equipment between watercourses, release from aquaria and intentional introductions). After the species arrives at a new place, there is often a vast increase in population size, which after a time recedes. The biomass can vary between years. *Elodea canadensis* affects other species due to competition on light and nutrients and can lead to a change in water quality towards eutrophication or oligotrophication, dependent upon the circumstances, something which can affect the living conditions for many other species. In many cases, establishment of *Elodea canadensis* has led to a considerable loss in biodiversity (Brandrud & Mjelde 1999), and to almost extinction of one red-listed Norwegian aquatic plant (*Najas flexilis*).

A typical course for spreading of *Elodea canadensis* is described by Fremstad (2011, 2012) which details the newly discovered occurrence in Frosta in Nord-Trøndelag county. The species was discovered in Liavatnet in Frosta in 2010, but may have been present for some years. This occurrence probably originates from waste from an aquarium. In 2011, Fremstad was informed by the county governor's office in Nord-Trøndelag that turves had, a few years previously, been transferred from Liavatnet to the drinking water source at Hovdalsvatnet a few kilometres away. A visit was made to Hovdalsvatnet and, as expected, *Elodea canadensis* was found washed onto land at two places. The turves had been transported to build a catchment pond.

addition to replacing native species. Examples include *Heracleum mantegazzianum*, *H. persicum*, *Lupinus polyphyllus*, *Reynoutria japonica* and *Rosa rugosa*. All of these species are mainly spread from garden waste (*Lupinus* also from sowing along roads and railways), and are very hardy and vigorous, and can in the course of only a few years form large, dense stands which not only inhibit the local flora, but which alter the physical and chemical characteristics of the soil, increase the danger of erosion, completely alter conditions for soil-dwelling mosses, fungi and insects, and reduce the possibilities for animals to find shelter and food. Some alien species secrete chemicals that prevent other species from germinating and grow in their vicinity (allelopathy), e.g. *H. persicum*, which contributes towards effective displacement of native species.

Most habitat types can become invaded by alien plants. Particularly vulnerable are intermediately to highly nutrient-rich limnological habitats, semi-natural habitats, other lowland habitats without a tree layer (e.g. coastal heath), as well as woodland and scrub types

on nutrient-rich soil. Clearly less vulnerable are boreal coniferous forest on more nutrient-poor soil, and also mountain habitats, probably because almost none of our alien species are from places with similar climatic or nutrient conditions. There are, however, exceptions. In the last 20 years, *Lonicera caerulea* from boreal parts of Eurasia has rapidly expanded from settlements and communities in boreal coniferous areas in Norway, and hot on its heels are some other plants from continental (inner) parts of Eastern Europe, Siberia, and Canada, such as *Crataegus sanguinea*, *Sweda sericea*, and *Elaeagnus commutata*.

Influence on native species

The effects of alien species upon native species (species–species interactions) can be classified into three broad categories:

- An alien species can occupy part or all of the niche and habitat of a native species at the same trophic level, and take over its resources (i.e. displacement)
- An alien species can greatly reduce the abundance of a native species, especially by predation or by parasitism
- An alien species can alter environmental conditions or become so influential that it indirectly reduces the abundance of one or several native species.

One of several classic examples of displacement is what happened after the deliberate introduction of eastern American *Sciurus carolinensis* into England in the 19th century. *S. carolinensis* took over the niche of the European *S. vulgaris*, especially in urban areas, almost completely displaced it, and fragmented the distribution of the resident species in Great Britain and Ireland (Okubo et al. 1989, Wauters & Gurnell 1999, see Sandro 2008 regarding further spread in Europe). In addition, *S. carolinensis* appears to be more resistant to disease, at least in Great Britain (Rushton et al. 2000, Gurnell et al. 2004), perhaps an example of "release from constraints". There is scarcely any equally dramatic example from Norway, although the decline of the native *Lutra lutra*

Box 18

Mammals and birds in conflict: *Neovison vison*

The American species *Neovison vison* established itself in Norway a short time after the first mink farm was established in 1927. In the space of 50 years it had colonised most of the country apart from some island areas such as Utsira, Froøyene, Træna and Værøy/Røst (Bevanger & Ålbu 1986, Bevanger 1990, Bevanger & Ree 1994). As a general rule, islands which lie at least 5 km from areas with a permanent population of *Neovison vison* appear to be free of this species (Bevanger & Henriksen 1995, Bevanger 2005). The consequences of the introduction of *Neovison vison* into Norway have been little studied, but there are many observations of it having killed seabirds, and many claim see a clear connection between the decline of for example *Cepphus grylle* and the occurrence of *Neovison vison* along the Norwegian coast (Johansen 1978, Røv & Frengen 1980, Folkestad 1982). From Sweden and Finland there are concrete data on how birdlife has reacted to the introduction of *Neovison vison*. The development of birdlife on islands with and without *Neovison vison* in the Baltic has been studied for many years (Nordström et al. 2002, 2003). Where *Neovison vison* has been removed, there was a clear increase in the number of breeding pairs of *Charadrius hiaticula*, *Stercorarius parasiticus*, *Sterna paradisaea*, and *Anthus petrosus*. *Alca torda* and *Cepphus grylle*, both of which had disappeared following the arrival of *Neovison vison*, returned in the course of the study period. This shows that *Neovison vison* has a clear effect upon seabird populations, but that it is also possible to implement measures to limit damage.

Photo: Morten Ekker

Neovison vison

following the introduction of the American *Neovison vison* may be comparable (Box 18).

Another example is *Lithocharis nigriceps*, which lives on rotting plant matter. It appears to have replaced the native *L. ochracea*, without any other apparent effects, after its arrival in Norway 70 years ago (Ødegaard 1999). Such direct species–species effects at the same trophic level are most relevant for vertebrates and more mobile invertebrates, organisms that actively seek a habitat. In the case of plants, fungi and algae this is less relevant, and probably also for the less mobile invertebrates.

Some of the more dramatic population reductions in native species due to predation and parasitism are found following import of predatory animals to areas where there previously were no predators. These can, in a short period of time, lead to the extinction of other species, as the native species have not developed any defence strategy (Sakai et al. 2001). There may also be major effects following import or immigration of predatory animals with other prey preferences or other behaviour than the native ones. This is one of the major threats posed by *Nyctereutes procyonoides*, which is on its way into Norway.

Other dramatic reductions can arise from the introduction of parasites. *Castanea crenata* has built up a pretty good resistance against a parasitic fungus, *Cryphonectria parasitica*; the fungus does not kill the tree. Subsequent to the Americans opening Japan for western influence in the late 19th century, the disease arrived in the USA in the early 20th century. The most important chestnut species (*Castanea dentata*) was, in the course of a few decades, reduced from being probably the commonest woodland tree species along the east coast to becoming almost extinct, with an estimated four million trees killed (Anagnostakis 1987). *C. dentata* still survives as root sprouts, but is killed by the disease after a few years and never reaches reproductive age. When American troops came to Europe at the end of the Second World War, they brought the disease with them to the Mediterranean, where it is now starting to wipe out the European *Castanea sativa* (see Robin & Heiniger 2001). Neither the *C. dentata* nor the *C. sativa* have so far had enough time to build up any resistance, and the two species may become extinct before that happens.

Two comparable Norwegian examples are diseases in *Ulmus* and *Fraxinus*. Dutch elm disease is caused by two species of Ascomycota (sac fungi) – *Ophiostoma ulmi* and *O. novo-ulmi* – originally probably from Asia. These species are spread from tree to tree by the beetle *Scolytus laevis*, but were probably imported into Norway with timber. Here they have, since the 1980s, spread over large parts of the lowlands of Østlandet and kill elms relentlessly. The same happened throughout Europe, perhaps worst in the west, where *Ulmus* species have been more important in woodlands in the British Isles than with us, and the same fungi are now starting to kill *Ulmus* woodlands in North America. Another alien species, ash die-back (also a sac fungus, *Hymenoscyphus pseudoalbidus*), was first observed in Norway in 2008, and has spread explosively. It eventually kills the tree. Its origins are unknown, although the disease was first observed in Eastern Europe and has in northerly latitudes to date caused most damage in the Baltic States. Both of these fungal diseases have already had such a large effect upon the whole population of *Ulmus glabra* and *Fraxinus excelsior* in Norway that these two tree species are included in the Norwegian Red List for species 2010. These are good examples of "release from constraints", since the host's resistance in its original range was a limiting factor for the parasite. It can hardly be called "enemy release", since the host was not the parasite's enemy. There is a real possibility that American and European *Castanea*, European *Ulmus*, and European *Fraxinus* will never manage to develop resistance.

There are also a number of introduced parasites and diseases in the marine environment that can harm populations. For example the Asiatic nematode *Anguillicoloides crassus* found in *Anguilla anguilla* has been rapidly expanding in Europe, at the same time that the European *Anguilla anguilla* population has been in strong decline. It has been speculated as to whether this parasite reduces the function of the swim bladder and energy reserves so much that *Anguilla anguilla* has problems in completing their spawning migration to the Sargasso Sea. It has not at present been possible to test this hypothesis. *Anguilla anguilla* is included on the Norwegian Red List as a critically endangered species. The American *Homarus americanus* may be the carrier of a bacterium (*Aerococcus viridans* which can cause the disease gaffkemia), which it manages to live with, but which can be fatal for the European *Homarus gammarus*. The disease is also identified in Norway. However, one has in recent years identified increasing new cases of epizoic shell disease in *Homarus americanus* caught in Norway. This disease has seriously affected *Homarus* populations in parts of the USA and Canada (Karlsbakk et al. 2011).

When an alien species causes structural changes to

one or more habitat types, it will normally also lead to changes in the equilibrium for a number of native species, normally in a negative way. The effects can apply to individuals or to populations. The individual effects can involve changes in appearance or behaviour, whereas population effects are linked to changes in reproduction and survival due to altered conditions for competition or predation (Parker et al. 1999). Irrespective of the alien species being a predator or a competitor, the effects upon native species can be graded from no effect to extinction.

The effects of predation are usually dramatic and rapid, especially in isolated systems such as oceanic islands, yet also in open systems, such as the coastal areas of Finnmark where *Paralithodes camtschatica* has devoured populations of a number of bottom-dwelling animals (Oug et al. 2011). The effects of competition are often slower, and not always as easy to discover, as changes in populations of native species may be difficult to demonstrate, at the same time as data from before introduction may be poor. One has assumed that immigrating specialists on the whole have little effect upon native species since niche requirements are not in conflict (Lawton 1984). Immigrating generalists, however, are more often assumed to be able to dominate following establishment in new environments, amongst others due to overlapping niche requirements (Pell & Tidemann 1997). These assumptions apply mainly to vertebrates and are perhaps less relevant for plants, fungi and smaller invertebrates. Even so, there are a good deal of cases also among plants where pure physical displacement or changes in habitat types have resulted in extinction or decimation of species, and then rather of species with small populations and with a restricted niche.

Up until 2000, *Najas flexilis* was only known in Norway from a number of shallow waters in Jæren as well as a very large occurrence at Steinfjord in Ringerike. The species disappeared from waters in Jæren due to eutrophication and overgrowing. At the time that the alien *Elodea canadensis* (see Box 17) established itself in Steinfjorden, 100% of all known occurrences of *Najas flexilis* in Norway were from Steinfjord. *Najas flexilis* was almost extinct in Norway

Box 19

Introgression in practice: *Malus sylvestris* and *M. ×domestica*

Malus ×domestica is probably a complicated hybrid species involving both western Asiatic and European ancestral species, amongst these our own native *M. sylvestris*. The relationship has not been thoroughly researched, although in areas where apples are grown extensively in Østlandet, Sørlandet and beside the fjords in Vestlandet, the wild apple population has many, and quite obvious, characteristics compared to garden apples. Hybrid plants comprise a considerable proportion of the population studied between Telemark and Rogaland counties. There are discussions as to how extensive hybridising actually is (Coart et al. 2006). Some studies in Denmark, The Netherlands, and Belgium conclude that introgression is limited (Coart et al. 2003, Larsen et al. 2006), whereas in other studies alleles from garden apples are found at relatively high frequencies in wild apples (Stephan et al. 2003). Agder Natural History Museum and Botanical Garden (Agder naturmuseum og botaniske hage) (see http://consideratecandicum.com/villeple/test/villeple_i_norge.html) and the Norwegian Forest and Landscape Institute (see http://www.skogoglandskap.no/Artsbeskrivelser/villeple) have begun to study the extent in Norway. The hybrids are fertile and have the potential to back-cross in both directions, although back-crossing towards garden apple is inhibited, probably as this species is purely kept in controlled environments (e.g. orchards). There is no such similar "brake" for preventing back-crossing with wild apple. The hybrids probably manage better in the wild than propagated garden apple, something which may eventually threaten wild apple as a native Norwegian species.

Photo: Oddvar Pedersen

Malus ×domestica × M. sylvestris

as a result of the progress of *Elodea canadensis*, not because *Elodea canadensis* occupied the same niche, but because *Elodea canadensis* altered the whole of the lake's environment, chemically and not least in altering light conditions. Since 2000 *Najas flexilis* has been discovered in several waters in Lista and is no longer threatened with extinction.

Physical displacement is also well documented for marine fouling species on hard bedrocks. In recent years in Western Europe and the southern North Sea several alien species of sponges and colony-forming sea squirts have arrived which outgrow and suffocate native sessile organisms and consequently completely take over the substrate.

Surprisingly often however, alien species have no detectable effect upon population size and survival of native species (Herbold & Moyle 1986) or only a subtle, insignificant effect. This applies to the majority of the species that are recorded as alien in Norway.

Genetic effects – introgression

The genetic effects of alien species are a special case of species–species interactions, where the alien species can transfer genes and therefore change the genetic constitution of native species. Transfer normally occurs during hybridisation, which is a common phenomenon, particularly among vascular plants. For vascular plants in Great Britain 25% of species hybridise (Stace 1975), as do approximately 10% of animals (Mallet 2005), in particular birds and fish. It is estimated that perhaps up to 1000 native Norwegian species are known to be able to hybridise. Hybridisation is, however, not the same as gene transfer between species. Most hybrids are sterile; and even if the hybrid is fertile, external mechanisms (e.g. courtship behaviour in birds) prevent gene flow from hybrids to their parent species. Gene transfer between a hybrid and its parent species is known as introgression, and it is only this which we consider under genetic effects.

Hybridisation in the wild between *Homarus americanus* and *H. gammarus* was proven for the first time ever in 2010. This may present a threat to the Norwegian lobster population which is already weakened from overfishing. Lobster hybrids are now kept in captivity to study whether they are sterile when reaching maturity at two years of age (Agnalt et al. 2012). Whilst other effects from problematic alien species can be reversible, the effects of introgression are often permanent or at least long-term. A native species which has acquired genes from an alien species is genetically contaminated as long as the genes are found in the population. This genetic contamination can lead to poorer adaptation to the native environment and will therefore be removed by selection. It could equally result in the opposite, a different adaptation, e.g. to habitat types undergoing change, and the alien genes can spread quickly in large parts of the population (e.g. between wild salmon and farmed salmon).

The contribution of hybridisation to the displacement of native by alien species is little studied (Huxel 1999). It has, however, been pointed out that hybridisation with alien species can increase the extinction risk of native species (Levin et al. 1996, Rhymer & Simberloff 1996). It is more usual that the native species, at least initially, is only contaminated in a boundary zone with the alien species. Hybridisation occurs mainly between closely related species, in other words species which have not been separated so long that insurmountable genetic differences (reproduction barriers) have built up. Such closely related species are normally separated geographically, and it is these geographic barriers that are broken down by the spread of alien species such that species to an increasing degree come into contact with one another (Carlton 1979, 1989, Carlton & Geller 1993, Williamson 1996). The globalisation of the world's flora and fauna which alien species cause, leads also to an erosion of the genetic differences between closely related taxa, which have evolved under different conditions (or perhaps just as often by chance). As such, genetic contamination is a very serious threat towards biodiversity.

There are relatively few examples of extensive introgression between alien and native species in the wild in Norway, although there are some. One of these is between the alien *Malus* x*domestica* and the native *M. sylvestris*, see Box 19. In total we have a few tens of examples of introgression from alien species in native Norwegian vascular plants.

This project deals only with the species level, apart from some vascular plant subspecies. This entails that the main sources of genetic contamination of Norwegian species are outside the project. The old, sturdy biological species concept (Mayr 1942) states that species are those taxa which cannot exchange genes, either in practice or in theory. Since the project primarily deals with the species level, it therefore excludes the majority of those organisms that can exchange genes. The main sources of genetic contamination are alien races, provenances or adaptations of the same species that we

have as native. Well known examples are farmed versus wild *Salmo salar* and farmed versus wild *Vulpes lagopus*. There have also been discussions as to whether imported seed from native conifers might weaken the native Norwegian population's adaptedness. It is not unthinkable that insect species found naturally in Norway, but which are used as utility animals imported from abroad, may have similar effects. This applies to, for example, the alien Myridae which is sold as *Macrolophus caliginosus* (= syn. *M. melanotoma*), although the product has been found to be *M. pygmaeus*, which is native in Norway.

Less well known is the massive import of foreign grass seed, partly for use in meadows, but equally for restoration along roads, railways, power plant waste tips etc. Alien species and cultivars of species such as *Festuca ovina*, *Festuca rubra*, *Schedonorus arundinaceus*, *Poa pratensis*, *Agrostis capillaris*, and many more, have been and are being sown along the road network throughout Norway, as far north as Svalbard. Sowing of roadsides occurs not least in less influenced landscapes, where the same species occur with locally adapted populations. The extent of genetic contamination from foreign seed has never been studied, but is probably considerable.

To a lesser degree, foreign cultivars of native Norwegian plants are imported as garden plants e.g. *Calluna vulgaris*, *Andromeda polifolia* (first seen for sale for gardens in 2012), *Hedera helix*, *Ilex aquifolium*, and *Myrica gale*. These will in all probability cause direct genetic contamination of Norwegian populations, it they are grown close to native occurrences of the same species.

Genetically modified organisms (GMO) are another aspect with many parallels with alien species. Most of the species it is currently of interest to modify genetically are species which we exploit on a large scale, either as livestock, food plants, textile plants, farmed fish, or forest trees. For those which are native species, the same will apply as with alien material towards native species described above. The danger of genetic contamination of native populations is very great if the GMO is fertile. The danger for the alien species (e.g. livestock and most food plants) is rather small, as only a small number of these species have been shown to hybridise with native species with introgression. There is much research in this field, amongst others with focus upon whether genetically modified cultural plants present a threat to the environment, even though to date no negative effects have been documented (http://www.gmo-compass.org/eng/safety/environmental_safety/). In an earlier evaluation of the genetic risk associated with imported vascular plants in Norway (Elven et al. 1991), the risk of genetic contamination of native vascular plants was found to be limited and only to apply to a few species. The conclusion today is unchanged.

Vectors for diseases and parasites

The classic example of an alien species as a vector for a disease is still the Black Death. Bubonic plague (caused by the bacteria *Pasteurella pestis*) is endemic in rodent populations in Central Asia, and more recently also in western USA. Bubonic plague arrived with *Rattus rattus* from Central Asia with goods and caravans along the Silk Route to the Black Sea, where it surfaced in the Crimea in 1349. This example contains all the vital ingredients: a disease, a vector species for dispersal, human activity which aids dispersal (international travel and trade), and a parasite that reaches a population with no resistance (the people of Europe). Note that both *Rattus rattus* as well as bubonic plague originated in Asia (i.e. that they were both alien species when they first arrived in Europe).

Most, or perhaps all, multicellular organisms have their own parasites, often several of them. If an alien species is lucky, then perhaps the parasite does not tag along when the species moves to a new area (e.g. if the movement occurs as an insect egg or as a seed), in other words "release from constraints". In very many cases the parasite does in fact tag along, which can cause new problems in new places. For example *Aphanomyces astaci* was probably brought in with *Pasifastacus leniusculus* and somehow entered Norwegian watercourse (illegal release or discharge from aquariums). This parasite destroyed large parts of the native population of *Astacus astacus* in Eastern Norway between 1971 and 1991. *Pasifastacus leniusculus* was released in Sweden to recreate a population for crayfish fishery. The species has since spread into Norway, which makes eradication of *Aphanomyces astaci* difficult. *Aphanomyces astaci* killed almost 100% of European freshwater crayfish, whereas *Pasifastacus leniusculus* is more or less resistant after thousands of years of co-evolution with *Aphanomyces astaci*. Thus we have deliberately introduced a vector species that may be responsible for the fact that the native crayfish population probably never will be free of the disease.

A geographically interesting example is that of *Cronartium ribicola* which switches host between a group of five-needled pine species (*Pinus* subgenus *Strobus*, with some species in Eurasia, and others in North America) and *Ribes rubrum*, *Ribes nigrum* and

Box 20

Mixed bag of parasites

The salmon parasite *Gyrodactylus salaris* has had serious consequences in Norway. In the mid-1970s the parasite was transported into Norway from Sweden during import of young salmon (*Salmo salar*) and rainbow trout (*Oncorhynchus mykiss*). Up until 2012 it is recorded from 48 watercourses around the country, where it has led to considerable reductions in the affected salmon populations (Johnsen 2006, K. Olstad pers. comm.). One has managed to eliminate the parasite in 20 of these watercourses using chemical treatments. The economic losses caused by this parasite are estimated to be 250-300 million NOK annually, and have to date cost the Norwegian state several billion NOK (Norwegian Directorate for Nature Management 2006).

Dutch elm disease is caused by two species of sac fungi (*Ophiostoma ulmi* and *O. novo-ulmi*) which kill the tree. This disease first became fully established in Norway in the 1980s, and is today widespread across large parts of Østlandet, where today one can see many dead *Ulmus* trees. The fungus is spread across short distances by the beetle *Scolytus laevis*, which is common on *Ulmus* both in Østlandet and in Vestlandet (Hansen & Sømme 1994). Spreading over larger distances occurs during timber transport, and it is likely that this is how the disease arrived into Norway. The disease can have dramatic ecological consequences for i.a. other insect species which live exclusively on Ulmus, such as some species of butterfly.

Bursaphelenchus xylophilus is a ca. 1 mm long roundworm. It is a serious pest of *Pinus sylvestris*, although it may also attack other conifers. It is currently spreading in east-Asia, where soon 1 million hectares of pine forest are infected. The species originates from North America, but has been spread with timber and wooden packaging, including to Europe where it caused a large amount of damage in Portugal in 1999. In warmer climates the species can kill whole forests in a short space of time, whereas in the north it gives vague symptoms which can resemble other forest pests. In addition to the direct damaging effects upon *Pinus sylvestris*, it is expected that this species will cause large effects in ecosystems and indirect effects from damage e.g. that other wood-dwelling invertebrates find increased available resources if conifers are weakened. The species is to date not recorded in Norway (as of 2011), but the danger of import and spread are still large due to import of timber and wooden packaging and that the vector beetles *Monochamus* spp. include one very common species in Norway (*M. sutor*). Recently another important vector for the nematode in south-eastern Asia (*M. alternatus*) has been found in packaging material in Norway (Kvamme & Magnusson 2006). A rise in temperature of 2 degrees up to 2050 is expected to cause a limited amount of mortality in *Pinus sylvestris* in Norway, if the nematode should occur. Temperature increases above this are expect to lead to serious consequences for Norwegian forests. The Norwegian Food Safety Authority has prepared an emergency plan for *Bursaphelenchus xylophilus*.

Monochamus alternatus, a vector for *Bursaphelenchus xylophilus*

Photo: Karsten Sund/Torstein Kvamme

Ribes uva-crispa (*Ribes* has many species in Eurasia, but most in North America). *Cronartium ribicola* is thought to be Eurasian and to have switched between, for example, *Pinus peuce* and *Ribes* species, although it is unlikely that it was originally found in the Nordic countries. We have no natural five-needled pines here in the north. The fungus was imported to North America, where it established itself and switched hosts between the native *Pinus strobus* and the countless native *Ribes species*. From there the fungi arrived back in Europe with *Pinus strobus* and began to damage our *R. nigrum* and *R. rubrum*.crops. *Cronartium ribicola* is an Eurasian parasite which arrived in the Nordic countries via North America, aided by a North American vector species. Some other examples include the Asian parasite *Varroa destructor* where the Asian *Apis cerana* was the vector transferring it to the European *Apis mellifera*, and the bacterial disease *Erwinia amylovora* where the Chinese species *Cotoneaster bullatus* and *C. salicifolius* are the main vectors for transmission to fruit trees in the Rosaceae. These, as well as some other examples, are shown in Box 20.

An alien species can also become a vector for a native parasite or disease and can increase the prevalence of such. This applies to for example *Nyctereutes procyonoides*, which appears to be a main vector for rabies, and *Scolytus laevis*, which is perhaps the only vector for transmitting Dutch elm disease. We have, however, limited knowledge regarding parasites in the wild here, in particular on bacteria and viruses. This applies regardless of whether we are talking about ecosystems on land, in fresh water or the sea. Parasites and diseases can have just as great effects as when an alien predator is imported, cf. the fungal disease affecting Castanea, which can be considered as a micropredator (Williamson 1996).

Climate change and alien species

The most important factor for an alien species being able to establish itself in Norway is climatic conditions. Species that are not adapted – or which cannot adapt – to boreal or Arctic/alpine conditions, will not cope with several months of snow and frost and a short active season. The global climatic changes, which here with us are anticipated to lead to increased precipitation, longer growing season as well as shorter and milder winters, will have significant consequences for the immigration potential for new species and for establishment and dispersal possibilities for those alien species that is already here, especially those that originate from southern latitudes (which is the case for the majority of them).

There are very few, if any, alien species in Norway which originate from a colder climate than we have here. The majority of our alien species come from areas with a warmer and equally moist, or more moist, climate. A few come from areas with a drier climate. It is expected that species which today are hampered from establishing themselves or expanding in Norway due to a relatively harsh climate, will have increased opportunity to do so. Some of these could also become invasive (Stachowicz et al. 2002).

Recent decades with favourable sea temperatures in the summertime have already led to changes in the marine flora and fauna in Norway. An example of this might be *Crassostrea gigas*, which has now become established many places along the coast of Southern Norway, probably spontaneous of larvae from parent populations on the Continent, and warm summers suitable for reproduction. The greatest increase in sea temperatures is expected in northern areas. At present, the number of ice-free days in the Bering Strait has increased considerably and opened up for increased shipping between the Pacific and northern areas. In combination with increasing oil activity in northern areas, there is an increased danger of introduction of alien species from the northern part of the Pacific. These species are adapted to the northern climate, and many will probably manage to establish themselves in the northern Atlantic Ocean.

Some scenarios seem pretty obvious: for example that some of the alien species which today only just manage indoors, may establish themselves outdoors (see insects in Box 21); many of the plants which are regularly imported, but which do not reproduce in Norway, may start to reproduce. *Ambrosia artemesiifolia* is an obvious candidate for this, and in addition one of the worst plants for those with pollen allergy. Alien insect species that manage to overwinter in Norway by exploiting the stable climate in compost heaps will be able to establish themselves in natural habitats (Ødegaard 1999, Ødegaard & Tømmerås 2000). We can already see these tendencies. Almost annually, one or more alien vascular plant which has not previously been known to reproduce has been found with the first reproductive population in Norway. A fresh example of this is *Polypogon monspeliensis*, with a population found in Oslo harbour in 2011, but discovered too late to be assessed for this project. We must also expect transfers. Imported vascular plants have their absolute main

Box 21

Insects which survive indoors – potential 'door knockers'

A number of insect species have been imported into Norway as stowaways with various merchandise or other travel goods. These have often first been found indoors. The Norwegian Institute of Public Health's database of cases reported between 1994 and 2012 shows that more than 300 such indoor species are regularly reported in Norway. In addition there are a number of casual species which have been introduced one or only a few times. For these species the doorstep, which they must cross in order to become alien species in Norway, is the boundary between indoors and outdoors.

Insects which are only found indoors may be very different in terms of their reproduction biology, invasion potential and history. Many species which have only been found indoors in Norway have no possibility to reproduce here, either indoors or outdoors. Some species can reproduce in the medium they were transported in, and can thus complete a few generations outdoors, but will not manage to become established. A third group is species that regularly reproduce indoors, but never will manage to overwinter in Norwegian nature. These are often dependent upon introduction of new individuals to maintain populations in Norway in the long term. Some indoor species are, however less demanding and can occur outdoors during summer. They spread in this way from house to house and maintain populations by reproducing indoors. Some of these are also suspected to reproduce outdoors. Such indoor species can be considered as 'door knockers' and their ecological impact has been assessed.

Many of the insect species reproducing indoors can probably also do so outdoors. Most of these have a long history in Norway which often stretches back to before 1800. This applies for example to some species of Ptininae, *Anthrenus museorum*, and *Dermestes lardarius*. Other species have gone the full way and established themselves outdoors. Many species of beetle associated with moulds indoors and in cellars (the families Cryptophagidae and Latridiidae), are examples of alien species as these species are found in the same environments in the wild e.g. in rotten parts of plants or in hollow trees.

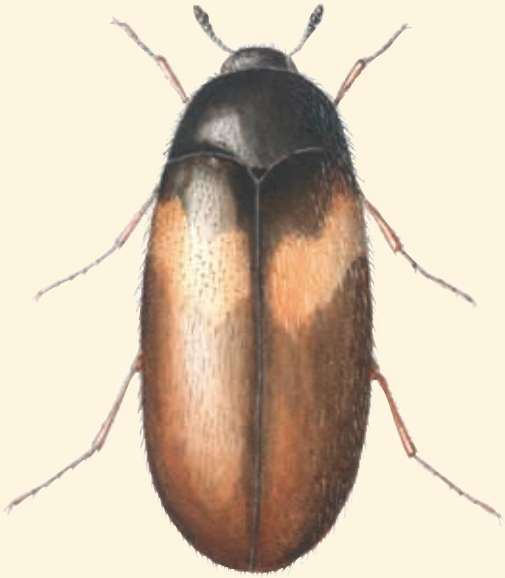


Illustration: Preben Ottesen FHI

Reesa vespulae

range in lower Eastern Norway and Southern Norway – Rogaland, clearly less in Western Norway north of Rogaland (perhaps due to lack of recording) and in Trøndelag, and much less in inner Eastern Norway and in Northern Norway. The expected climate changes may open both the dry parts of inner Eastern Norway and the currently cooler parts from Western Norway and northwards, at the same time that lower? Eastern Norway and Southern Norway – Rogaland will be able to receive more species from the south and west. The British Isles have hundreds of alien vascular plants which are not yet identified or not yet recorded as reproducing in Norway.

A number of alien species may move into Norway due to climate change. These are known as 'door knockers'. Two groups are ready to move in to the wild in Norway. The first group are those insects which today only survive indoors (Box 21). These can easily cross the doorstep and become established outside. The other group is the large number of garden plants, probably hundreds, which can reproduce in Norwegian gardens, but have not yet taken the step into the wild in Norway.

The balance between alien and native species will be displaced to the benefit of alien species with the expected climate changes. Whilst practically all

alien species will benefit from the expected changes, northern, alpine and continental native species will be at a disadvantage, both due to poorer conditions locally and a reduction of the area available in Norway. The expected decline for these will be intensified by competition from alien species.

Acknowledgements

During preparation of this chapter many elements from the Norwegian Black List 2007 (Gederaas et al. 2007) were used. We would like to thank two of the authors of that document, Kjetil Bevanger and Eli Fremstad, as well as Hanne Hegre Grundt, Vivian Husa and Anders Jelmert who have provided important contributions to this chapter.

Methods and set of criteria

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At present, there is no internationally accepted set of criteria for ecological impact assessments of alien species (see e.g. Verbrugge et al. 2010). The set of criteria used here has been developed specifically for this purpose (Sandvik et al. 2013, with some minor modifications). The development of the set of criteria aimed at *quantitative* and *generic* methods, and at risk categories that convey the *ecological impact* of a species in Norwegian nature (see Box 1).

The most important alteration compared to the set of criteria used in the previous Norwegian Black List 2007 (Gederaas et al. 2007), is that the new set of criteria is semi-quantitative. The set of criteria uses precisely defined threshold values, as also used in connection with Red Lists (IUCN 2001, Kålås et al. 2010). There are a number of advantages associated with quantitative as opposed to qualitative impact assessments. The most obvious is that the method reduces the subjectivity which is always a part of expert judgements. The result is therefore transparent, repeatable and testable. Decision-makers, interested parties or other experts can therefore easily verify the assessments that built the basis for the impact category of a given species. Quantitative assessments are also easily adjusted to newly acquired knowledge or potential corrections, as the end category is not based upon a subjective total assessment of the species, but upon independent criteria, which may be updated or corrected separately.

The main difference from other sets of criteria for impact assessment of alien species is that the Norwegian criteria are generic, i.e. they can be used for all groups of organisms (*taxa*). The impact categories are therefore comparable for fungi, insects, echinoderms etc.

The ecological impact of alien species in nature is proportional to the area that is colonised, to the density the species achieves within that area, and to the effect that an individual of the species has in Norwegian nature (Parker et al. 1999). As the exact area colonised is often unknown, especially when colonisation is not complete, area may be replaced with the species' invasion potential. Population density and per-capita effect can on the other hand be integrated into a measure of local ecological effect. The expected ecological *impact* can thus be defined as the product of *invasion potential* and ecological *effect* (see Box 22). As these two factors must be multiplied, and not added, if the ecological impact is to be quantified, a species will have a small impact whenever one of the factors are small, regardless as to how large the other factor is. For this reason, alien species' impact on Norwegian nature can best

Petasites hybridus
Photo: Åslaug Viken

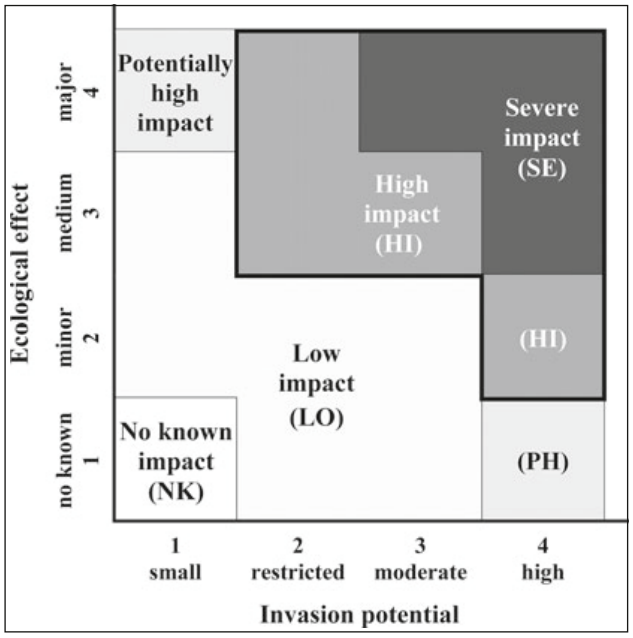

Figure 3. Impact categories for alien species are dependent upon their invasion potential and ecological effect. The system is based upon five impact categories (Table 1), dependent upon the interaction between invasion potential (Table 2) and ecological effect (Table 3). Species with a severe or high impact make up the Black List.

be portrayed as a two-dimensional figure, where impact is indicated by the species position along two axes – an invasion axis and an effect axis (Figure 3).

Classification of alien species into impact categories comprises nine criteria, of which three determine the species' invasion potential and six the ecological effect. Species are evaluated in relation to all criteria, and can on that basis be placed into four subcategories along each of the axes (Figure 3). A species' position along each axis is determined by those criteria which result in the highest subcategory. The species is then placed into one of the five following impact categories: *severe* (SE), *high* (HI), *potentially high* (PH), *low* (LO) or *no known* (NK) impact (Table 1; cf. Box 22). The following sections explain these criteria in more detail. The corresponding threshold values are shown in Tables 2 and 3.

Invasion axis

Alien species are classified along the invasion axis dependent upon whether they have a small, restricted, moderate or high invasion potential. Invasion processes can be split into two phases, which form the basis for one criterion each: establishment and expansion (Table

Box 22
Risk, impact and effect – an explanation of terminology used

A risk assessment does not only take into consideration the consequences of a future undesirable event, but also the probability of that event occurring. A risk might therefore be quite high, even though the probability for the event occurring is small, given that the consequences of such an event are great. Risk is therefore defined as the product of an event's consequences and probability. Events which are considered for alien species are their invasion of Norwegian nature (invasion axis in Figure 3 and subcategories in Table 2), their ecological effect (effect axis in Figure 3 and subcategories in table 3), and their impact on Norwegian nature (grey shaded areas in Figure 3 and final categories in Table 1). Both invasion potential, ecological effect and impact on Norwegian nature can all be understood as risks, i.e. they are separately determined by their respective consequences and probabilities. At the same time impact is defined as the product of invasion potential and ecological effect, something which can be expressed as:

$$\text{Impact} = \underbrace{\text{consequence of invasion} \cdot \text{probability of invasion}}_{\text{invasion potential (= risk of invasion)}} \cdot \underbrace{\text{consequence of effect} \cdot \text{probability of effect}}_{\text{(risk of) effect}}$$

$$= \underbrace{\text{consequence of invasion} \cdot \text{consequence of effect}}_{\text{consequence of impact}} \cdot \underbrace{\text{probability of invasion} \cdot \text{probability of effect}}_{\text{probability of impact}}$$

During the risk assessments of alien species, probability was taken into account by providing prediction or confidence intervals (see section on "Uncertainty"). Criterion documentation indicates the upper confidence limit, i.e. the greatest consequence resulting from invasion, effect or impact which might occur with reasonable probability.

Table 1. Impact categories for alien species. Assignment of species to these categories is according to Figure 3 and the criteria which are described in Tables 2 and 3 as well as in the main text. "Axis / axes" refer to the invasion and effect axes in Figure 3.

SE	Severe impact	Alien species with a severe impact are actually or potentially ecologically harmful species and have the potential to become established across large areas. These species are included in the Black List.
HI	High impact	Alien species with a high impact are characterized by a combination of a high subcategory along one axis and a intermediate category along the other. These have either restricted/ moderate ability to spread, but cause at least a medium ecological effect, or alternatively only a minor ecological effect but have a high invasion potential. These species are included in the Black List.
PH	Potentially high impact	Alien species with a potentially high impact have a maximum score along one axis, but a minimal score along the other. They have either high ecological effects combined with a low invasion potential, or a high invasion potential without any known ecological effect. These species are not included in the Black List.
LO	Low impact	Alien species with a low impact are not documented as having any substantial impact upon Norwegian nature. These species are not included on the Black List.
NK	No known impact	Alien species which achieve the lowest subcategory along both axes, have no known impact. These species are not included on the Black List.

Table 2. Subcategories, criteria and threshold values for classifying the invasion potential of alien species. Species are assessed according to all criteria (B_1 - B_3 are considered as one criterion), and the highest subcategory which satisfies at least one criterion, is chosen.

Criterion	A	B_1	B_2	B_3	C
Subcategory for invasion potential	Expected population lifetime[a]	Expansion velocity	Increase in area of occupancy	Increase in occurrences	Area of habitat type occupied
1: Small invasion potential	< min. (10 years, 5 generations)	< 0,3 km/year	≤ 0 % per year	≤ 0 % per decade	< 5 %
2: Restricted invasion potential	≥ min. (10 years, 5 generations)	≥ 0,3 km/year	> 0 % per year	> 0 % per decade	≥ 5 %
3: Moderate invasion potential	≥ min. (50 years, 10 generations) *AND* **B** ≥ **2**[b]	≥ 10 km/year *AND* **A** ≥ **2**[b]	> 1 % per year *AND* **A** ≥ **2**[b]	> 25 % per decade *AND* **A** ≥ **2**[b]	≥ 10 %
4: High invasion potential	≥ 1000 year *AND* **B** ≥ **3**[b]	≥ 30 km/year *AND* **A** ≥ **3**[b]	> 2 % per year *AND* **A** ≥ **3**[b]	> 50 % per decade *AND* **A** ≥ **3**[b]	≥ 20 %

Noter
a When the expected population lifetime is expressed in both years and generations, the one giving the shortest period is prevailing
b In order that categories A and B satisfy the two highest subcategories (3/4), the other criterion (B or A) must meet the conditions 2 or 3, respectively, for invasion potential. If these additional conditions are not met, the subcategory one step lower is chosen.

2). A third invasion criterion relates to the proportion of habitats that can be colonised.

A. *Expected population lifetime.* The greater the probability a species has for establishment, the higher it scores along the invasion axis. Establishment probability is here evaluated in terms of the species' expected population lifetime in Norway. Expected population lifetime is defined as the arithmetic mean time to extinction (see Sandvik et al. 2013). This method to specify establishment probability is closely related to extinction probability that is used in species Red Lists. Therefore, the A-criterion can be considered as a mirrored version of the E-criterion in Red Lists (IUCN 2001, Kålås et al. 2010): the greater the likelihood that an alien species has to become extinct in Norway (alternatively, the shorter the expected lifetime for the species in Norway), the less likely it will become established. The two measures can be readily converted into one another, e.g. expected lifetimes of 10, 50 and 1000 years (Table 2) imply extinction probabilities within 20 years of 86, 33 and 2 per cent, respectively. For species with short generation times these threshold values may be too high, and therefore the set of criteria operates with two alternative time scales – one indicated as years and the other as generations. Of these the shortest time interval shall be used (Table 2). There are different ways to estimate expected lifetime, and the set of criteria does not specify how this is accomplished in each individual case. One way is to use population viability analyses (Beissinger & McCullough 2002), which model a species' future population dynamics; another is numerical estimation (Sandvik 2011). The expected population lifetime of an alien species is affected by several factors, in particular population size and growth rate, but also by their variability (Lande et al. 2003). The population size of alien species is determined initially by the *propagule pressure,* i.e. the frequency of introductions and the number of individuals per introduction (Lockwood et al. 2005, Colautti et al. 2006, Blackburn et al. 2009). Growth rate is determined by the species' demographic

properties such as lifespan, age of maturity, fecundity etc. Variability is mainly due to demographic or environmental stochasticity (chance variation in mortality, fertility or sex ratio; cold winters, drought periods etc.). The advantage of using species' expected lifetime as a criterion is that it integrates several factors into one measure, and can therefore be used across a wide range of species with very different lifestyles and demography / life histories. Population lifetime – and consequently establishment probability – will be greater when the species has a large population, a high growth rate and/or a low demographic or environmental variance.

B. *Mean expansion rate.* – The greater a species' capability to spread, the higher its score will be along the invasion axis. Expansion is in this case defined as *any* form of movement or spread of the species, regardless as to which mechanisms, vectors or means of transport are involved. Expansion therefore includes not only "natural" spread via active movements or passive dispersal (e.g. with the aid of wind, water or animals), but also intentional or unintentional anthropological transport or separate introductions. Expansion capability may be specified in three different ways (Table 2), and it is sufficient that one of the three sub-criteria is assessed for a species:

B_1. *Expansion velocity.* – Expansion velocity is defined as the average speed of an actual or assumed invasion front, measured in kilometres per year from the first observation of the species or its reconstructed place of reintroduction and up to the invasion front. In accordance with the broad definition of expansion, expansion velocity is estimated on the basis of all observations of the species, even where these may be the result of separate introductions. This definition of expansion velocity might overestimate the species' "natural" dispersal rate, but provides an approximate description of the annual increase in the species' extent of occurrence (Sandvik & Sæther 2012).

B_2. *Increase in area of occupancy.* – Where expansion velocity is difficult to estimate, it can be replaced with a rough estimate of the increase in the species' area of occupancy. This increase is estimated as the annual growth rate of the area of occupancy (e.g. based upon a survival analysis; Skarpaas & Stabbetorp 2011, Skarpaas 2012).

B_3. *Increase in occurrences.* – Where there is too few data to estimate increase in area of occupancy, the increase in occurrences can be used instead. This is defined as the percentage change in total recorded occurrences per decade. Threshold levels differ from criterion B2, both because the period of time is longer and because the total number of occurrences is more variable.

C. *Area of habitat type occupied.* – This criterion measures the degree of colonisation of the various habitat types in which an alien species occurs. For each of the habitat types affected, it quantifies the percentage of the area of occupancy of the habitat type that will become colonised by the species in the course of 50 years. The criterion is used when this proportion exceeds a certain threshold for at least one habitat type (Table 2). The definition and boundaries of habitat types are in accordance with "Nature types in Norway" (Halvorsen et al. 2009. To be precise, major and basic types within the landscape element and ecological systems are assessed. In some cases a finer resolution can be used). It is expected that criterion C will seldom be a decisive criterion along the invasion axis, as criteria A and B will in most circumstances give a result long before criterion C. The criterion is included to take account of the fact that single, proportionately rare habitat types could become colonised (and affected) by an alien species which evades criteria A and B. This might for example be the case where an alien species is a specialist of a less common habitat type. Such a species might pose a threat towards that habitat type, even though the population lifetime and rate of spread are not known to be particularly high.

The placement of an alien species along the invasion axis is determined by the subcategory to which the species is assigned as the result of criteria A to C. The invasion potential is determined as a product – and not as the sum – of the establishment probability and the expansion rate. An alien species which is well established within a restricted area and which shows no sign of further spreading has low invasion potential. The same applies to alien species which experience numerous and regular introductions across the country, whilst the individual populations are not viable. Therefore, a species cannot achieve invasion categories 3 and 4 of criteria A and B unless the other criterion also exceeds a certain threshold. If this additional condition is not fulfilled, the subcategory which is one step lower is chosen (i.e. 2 instead of 3; 3 instead of 4). This takes into account that a species does not have a great invasion potential if it *only* has a high establishment probability or *only* has high expansion rate, whereas the other category is low. Criterion C does not interfere with A and B, as the intention is to take account of invasion of relatively rare habitat types, and its definition contains aspects of both establishment and expansion. A threat towards

Table 3. Subcategories, criteria and threshold values for classifying the ecological effect of alien species. Species are assessed according to all criteria, and the highest subcategory which satisfies at least one criterion, is chosen. (Bracketed information is not regarded as threshold value. The term "unlikely" thus leads to subcategory 1, whereas the next threshold value involves an effect leading directly to subcategory 3).

Criterion	D	E	F	G	H	I
	Documented or potential effect within 50 years* upon				Documented or potential transmission of	
	native species		habitat types			
Ecological effect subcategory	threatened/keystone	other	threatened/rare	other	genes	parasites or pathogens
1: No known effect	unlikely	little	unlikely	≥ 0 %	unlikely	unlikely
2: Minor effect	[unlikely]	weak	[unlikely]	≥ 5 %	[unlikely]	existing parasites to existing hosts such that prevalence increases
3: Medium effect	negligble	local displacement	> 0 %	≥ 10 %	to native species	existing parasites to novel hosts
4: Major effect	≥ weak	regional displacement	≥ 5 %	≥ 20 %	to threatened native species	existing parasites to novel threatened hosts OR of novel parasites

* or within five generations, if this is a longer time frame than 50 years (yet no more than 300 years).

rare habitat types alone can therefore give a result along the invasion axis, i.e. without "help" from the A- or B-criterion.

Effect axis

Alien species are classified along the effect axis depending upon whether they have no known effect, minor, medium or a major ecological effect in Norwegian nature. The more interactions an alien species has with a native species and the greater the change of state that the species causes to Norwegian habitat types, the higher its score along the effect axis (Table 3). The effects are considered over a 50-year perspective. This means that not only current effects are assessed, but also effects which, based upon documented knowledge on the alien species' biology, can be expected to occur within the next 50 years. For species with generation times of more than 10 years, a time horizon of 5 generations is used.

Interactions with native species include mainly competition with, predation upon and parasitism of wild native species, but can also include indirect effects (e.g. so-called apparent competition or trophic cascades; White et al. 2006). Only negative effects are taken into account; neutral and positive interactions (e.g. facilitation; Bruno et al. 2003) are not considered, as these do not pose any threat towards Norwegian nature. In principle, ecological effects can be quantified rather accurately (Laksa & Wootton 1998), e.g. by measuring the reduction in the growth rate of native species, carrying capacity, area occupied or extent of occurrence caused by an alien species. As such quantifications require extensive and time-consuming field studies (Doak et al. 2008, Novak & Wootton 2008), the set of criteria allows for a more subjective judgement of the effect upon native species. Effects upon native species are considered as unlikely if the species is not involved in negative interactions with native species; as negligible if the interactions with native species will not result in negative effects which are measureable at population level; and as weak if interactions reduce the growth rate or carrying capacity of native species, but without displacing species. Displacement is defined as a (potential) reduction of the area of occupancy or extent of occurrence of native species. Ecological interactions with native species are measured by two criteria:

D. *Effects on native threatened or keystone species.* – Any documented or likely negative ecological interaction with at least one native threatened species or native keystone species is automatically classified as at least a medium effect (i.e. subcategory 3). Threatened species here refers to vulnerable, endangered or critically endangered species according to the Norwegian Red List for Species 2010 (Kålås et al. 2010). Keystone species are species which, despite low amounts (measured in numbers or biomass), can have a great effect on the amount, distribution and diversity of other species.

E. *Effects on other native species.* – If none of the native species involved in interactions with the alien species is threatened or a keystone species, its effect is classified as weaker. To achieve a medium or major effect,

there must be documentation of, or likelihood for, displacement locally or regionally.

Alien species can also have negative effects at the landscape level, e.g. by altering vegetation stratification, overgrowing, and thinning of woodland or eutrophication of a waterbody. These effects can be measured in the habitat types affected as changes in condition along relevant ecoclines, i.e. as changes in the species composition or structure of a habitat (see "Nature types in Norway" for definition of habitat types, condition ecoclines and changes in condition; Halvorsen et al. 2009). A change in condition caused by an alien species is considered as *significant* if in the course of 50 years it amounts to at least one defined step along a condition ecocline. (In the case of changes in conditions that have already begun, changes need to be at least one step *more* than would have taken place without the presence of the alien species). The effect of an alien species is here quantified as the proportion of the habitat type's area of occupancy or extent of occurrence that is subjected to significant changes. Where several habitat types are affected by a species, the value for the habitat type with the greatest affected proportion of area is used.

F. *Effects on threatened or rare habitat types.* – Any significant change in conditions in at least one threatened or rare habitat type is automatically classified as having at least a medium effect (i.e. subcategory 3). By threatened habitat we mean vulnerable, endangered or critically endangered habitat types according to the Norwegian Red List for habitat types (Lindgaard & Henriksen 2011). By rare habitat types we mean habitat types that are near threatened due to few occurrences (i.e. on the basis of criteria 2 or 3 for red-listing of habitat types: Lindgaard & Henriksen 2011).

G. *Effects on other habitat types.* – If none of the habitat types that undergo state changes caused by alien species are threatened or rare, the effect is classified as weaker. Habitat types that are largely affected by human activities, such as constructed and artificial sites, are not considered.

The two remaining criteria deal with the transmission of genetic material or parasites.

H. *Transmission of genes (genetic introgression).* – If it is documented or likely that an alien species can transmit genes to native species (*introgression* e.g. by hybridising), it is automatically classified as having a medium effect (i.e. subcategory 3). If at least one of the native species affected is a threatened or keystone species, the effect is raised to "major".

I. Transmission of parasites or pathogens. – This criterion is used if it is documented or likely that an alien species can act as a vector for, i.e. transmit, parasites (including pathogens such as bacteria and viruses) to native species. If this transmission leads to an increased *prevalence* (occurrence) of existing parasites in a native species which already is a host for the same parasite, then the effect is classified as minor (i.e. subcategory 2). If the transmission affects a native species which was not previously a host for that parasite, then the alien vector is classified as having a medium effect (i.e. subcategory 3). The effect is upgraded to major (i.e. subcategory 4) under two conditions: If the alien species is a vector for a parasite not previously observed in Norway, or if at least one of the affected native species is a threatened or a keystone species.

The placement of an alien species along the effect axis is determined by the *highest* subcategory which the species obtains using criteria D to I. This is better than summing the various effects, which would underestimate the effect of a species that scores very high in one criterion, yet low in other criteria (Makowski & Mittinty 2010).

The effect axis is limited to identifying ecological effects. Anthropocentric effects of alien species, such as direct or indirect effects upon human health, economy or aesthetics, are deliberately excluded. This is because the aim of the set of criteria is a purely ecological impact assessment. Where knowledge on anthropocentric effects is available, this information is included in the species information, but is not used in the impact assessment itself.

Impact categories

The four subcategories along each axis provide the basis for 16 possible combinations of invasion potential and ecological effects (Figure 3). The position of a species in Figure 3 shows the risk to Norwegian nature posed by that species, and determines which of the five impact categories the species is placed in (Table 1). Species in the two highest impact categories (SE and HI) are included in the Black List.

Alien species with a potentially high impact (PH) have at present little influence on Norwegian nature, but are placed in their own impact category because their influence can increase, due to unforeseen changes. These changes might be evolutionary or ecological. Even though rapid evolutionary changes have been documented in several alien species (Cox 2004, Lavergne &

Molofsky 2007, Whitney & Gabler 2008), such changes cannot be predicted. The same applies to unexpected ecological interactions, especially indirect ones (White et al. 2006, Doak et al. 2008). The category PH (potentially high impact) is adopted to take into account and to highlight such unpredictability.

If the exact combination of subcategories is given, such information is added after the abbreviation: **HI:4,2** or **HI:2,3** show two high impact species, where the first one has a high invasion potential and minor effects, whereas the second has a restricted invasion potential and medium effects. This will be particularly relevant for species with potentially high impact, where **PH:1,4** and **PH:4,1** species will have different properties. Further, one can present the criterion which forms the basis for classification. For example, **HI:2(b1),4(egi)** indicates a species that has been classified as a high-impact species because it displaces native species, alters habitat types, transmits parasites and has a limited capability to spread; and similarly a species given as **H1:2(a),4(h)** falls under the same impact category due to hybridisation and the population's expected lifetime.

Documentation

A criterion has to be documented using published or available data in order to be considered as having been fulfilled. Quantitative assessments demand more thorough documentation than qualitative. Criteria documentation may consist of one specific, referenced number. It may on the other hand be a qualified estimate. Qualified estimates are not in contrast to a quantitative method, as long as they are documented and based upon numerical threshold values. Documentation may thus underpin that a value lies between two specified threshold levels, and does not necessarily have to present a single number.

For a number of species there will not be enough documentation on their invasion potential or ecological effects on Norwegian nature. This applies to 'door knockers', but also to many alien species which already occur in Norway, either because they are new, difficult to discoverer or merely poorly studied. If there is not enough good data available from Norway, then documentation should, in this order, be sought from:

- Data for the species in countries with ecoclimatic conditions comparable to those in Norway
- Data for the species in countries with ecoclimatic conditions different to those in Norway,
- Data from closely related species with comparable lifestyles and demography.

For most species, only part of the population, area of occupancy and extent of occurrence in Norway will be known. Therefore, to assign a level of uncertainty is an important part of the impact assessment. This level of uncertainty is the factor used for adjusting known occurrences in relation to supposed occurrences, or an estimate of how large a part of the Norwegian population where we do not know the occurrence. This is a percentage and is estimated by combining knowledge of a species' habitat requirements and known occurrences in Norway with knowledge of area of occupancy of relevant habitats. For small organisms with a discreet way of life, the level of uncertainty may be many times higher than the known part of the population. The degree of uncertainty may illustrate knowledge gaps about a species' occurrence in Norway.

Uncertainty

The classification system for alien species does not operate with a category for data deficiency (as in "DD" in the Red List). There are several reasons for this. First, uncertainty is not either/or, but rather a question of degree, and should therefore be included in the impact assessment, and not be separated from it as a category in its own right. There are several ways to take uncertainty into account. For numerical estimates (such that e.g. are required for criteria along the invasion axis) one can assign uncertainty as prediction intervals or as confidence intervals. If the lower and upper confidence limits lie within the same thresholds, then this subcategory is chosen. However, if the confidence intervals cover span over several subcategories, then the highest of these applies. (With an estimated rate of spread of 5 ± 4 km per year, the whole confidence interval lies within subcategory 2. If however the rate of spread is estimated to be 9 ± 2 km per year, the confidence interval includes subcategories 2 and 3, such that subcategory 3 is assigned; cf. Table 2.). This approach combines a precautionary principle with scientific requirements of testability and documentation.

Whenever it is not possible to calculate confidence intervals, the available knowledge can be used to give likely and documented extremes for this parameter. These are treated in the same way as confidence intervals.

Another reason to deviate from the Red List system's data deficient category is that lack of data has different

meanings for threatened than for invasive species. If one has little or no documented knowledge about a species, this is often due to its rareness. All else being equal, this makes it more likely that the species is threatened with extinction, but is also less likely that it is invasive. When documentation about invasion potential or ecological effect is lacking, a species will be classified as having "no known impact". This does not necessarily mean that a species will not have an effect on Norwegian nature, but merely that no knowledge is available that suggests this. Even though such an assessment may later be shown to have been erroneous and require a revision, it is merely likely that the species will present a high or severe impact, as in this case one would expect that there was documentation available from other countries.

The work of the expert groups

The work of the expert groups commenced during spring 2011, and continued until 12th July 2012 when the finished product *Alien species in Norway – with the Norwegian Black List 2012* was launched. Eleven groups of experts with 48 specialists (see Table 4) from various fields have carried out the assessments, on behalf of NBIC. Experts have been aided by other persons with relevant expertise where required. Four meetings have been held between NBIC and the expert groups. The expert groups have also held internal meetings where necessary.

The expert groups' mandate involves compilation of species lists for alien species in Norway in accordance with the definition and delimitations for this project, as well as completion of ecological impact assessments for all of the alien species which reproduce in Norwegian nature or which are likely to do so within the next 50 years (*). In addition, each of the expert groups have completed ecological impact assessments for a number of 'door knockers'.

Selection of species

Before the experts were able to begin to assess the impact of alien species in Norway, there was a need to compile species lists for relevant species in accordance with the definition and delimitations of this project. The Norwegian Black List of 2007 (Gederaas et al. 2007) was used as a starting point for selecting species. Thereafter, considerations were made as to whether species included in the Norwegian Red List for Species 2010 (Kålås et al. 2010) could also be eligible for impact assessment. The Red List distinguishes between species where no assessment of red list status is made for species in categories "not suitable" (NA = not applicable and NE = not evaluated). The category NA is mainly used for alien species and casual or sporadic guests, whereas NA is mainly used for groups of species which are not treated for red listing. The experts' own knowledge about alien species resulted in even more species being included in the selection, which forms the starting point for work on impact assessment of alien species in Norway.

* Either total number of years or total generations are used dependent upon which of these results in a higher category (see chapter "Methods and set of criteria")

Salvelinus namaycush
Photo: John G. Backer

Table 4. The expert groups and their members. Group leaders are shown in bold Group of experts 2012	
Algae	
Kjersti Sjøtun	University of Bergen, Department of Biology, NO-5020 BERGEN
Vivian Husa	Institute of Marine Research, NO-5817 Bergen
Jan Rueness	University of Oslo, Department of Biosciences, NO-0316 Oslo
Fungi	
Tor Erik Brandrud	Norwegian Institute for Nature Research, NO-0349 Oslo
Klaus Høiland	University of Oslo, Department of Biosciences, NO-0316 Oslo
Halvor Solheim	Norwegian Forest and Landscape Institute, NO-1431 Ås
Leif Sundheim	Norwegian Institute for Agricultural and Environmental Research, NO-1432 Ås
Mosses	
Kristian Hassel	Norwegian University of Science and Technology, Museum of Natural History and Archaeology, NO-7491 Trondheim
Vascular plants	
Reidar Elven	University of Oslo, Natural History Museum, NO-0318 Oslo
Inger Greve Alsos (Svalbard)	University of Tromsø, Tromsø University Museum, NO-9037 Tromsø
Kristina Bjureke	University of Oslo, Natural History Museum, NO-0318 Oslo
Eli Fremstad	Norwegian University of Science and Technology, Museum of Natural History and Archaeology, NO-7491 Trondheim
Hanne Hegre Grundt	FlowerPower, NO-0854 Oslo
Marit Mjelde	Norwegian Institute for Water Research, NO-0349 Olso
Tor Myking	Norwegian Forest and Landscape Institute, NO-5244 Fana
Oddvar Pedersen	University of Oslo, Natural History Museum, NO-0318 Oslo
Per Anker Pedersen	University of Life Sciences, Plant and Environmental Sciences, NO-1432 Ås
Marine invertebrates	
Eivind Oug	Norwegian Institute for Water Research, NO-4879 Grimstad
Bjørn Gulliksen	University of Tromsø, Norwegian College of Fishery Science, NO-9037 Tromsø
Anders Jelmert	Institute of Marine Research, NO-5817 Bergen
Jon-Arne Sneli	NO-7343 Vognill
Jan H. Sundet	Institute of Marine Research, NO-9294 Tromsø
Terrestrial and freshwater invertebrates	
Frode Ødegaard (terrestrial)	Norwegian Institute for Nature Research, NO-7485 Trondheim
Kjell Magne Olsen (freshwater)	BioFokus, NO-0349 Oslo
Øivind Gammelmo	BioFokus, NO-0349 Oslo
Lars Ove Hansen	University of Oslo, Natural History Museum, NO-0318 Oslo
Trond Hofsvang	Norwegian Institute for Agricultural and Environmental Research, NO-1432 Ås
Ole J. Lønnve	BioFokus, NO-0349 Oslo
Preben Ottesen	Norwegian Institute of Public Health, NO-0403 Oslo
Ann Kristin Schartau	Norwegian Institute for Nature Research, NO-0349 Oslo
Arnstein Staverløkk	Norwegian Institute for Nature Research, NO-7485 Trondheim
Geir Søli	University of Oslo, Natural History Museum, NO-0318 Oslo
Leif Aarvik	University of Oslo, Natural History Museum, NO-0318 Oslo
Roundworms and flatworms	
Tor Atle Mo	Norwegian Veterinary Institute, NO-0106 Oslo
Bjørn Gjerde	Norwegian School of Veterinary Science, NO-0033 Oslo
Christer Magnusson	Norwegian Institute for Agricultural and Environmental Research, NO-1432 Ås
Fish	
Trygve Hesthagen (freshwater)	Norwegian Institute for Nature Research, NO-7485 Trondheim
Kjell Nedreaas (marine)	Institute of Marine Research, NO-5817 Bergen
Åge Brabrand	University of Oslo, Natural History Museum, NO-0318 Oslo
Jakob Gjøsæter	Institute of Marine Research, NO-4817 His
Odd Terje Sandlund	Norwegian Institute for Nature Research, NO-7485 Trondheim
Rupert Wienerroither	Institute of Marine Research, NO-5817 Bergen
Amphibians and reptiles	
Dag Dolmen	Norwegian University of Science and Technology, Museum of Natural History and Archaeology, NO-7491 Trondheim
Birds	
John Atle Kålås	Norwegian Institute for Nature Research, NO-7485 Trondheim
Jan Ove Gjershaug	Norwegian Institute for Nature Research, NO-7485 Trondheim
Mammals	
Jon E. Swenson	University of life Sciences, Ecology and Natural Resource Management, NO-1432 Ås
Per Ole Syvertsen	Helgeland Museum, Department of Natural History, NO-8601 Mo i Rana
Øystein Wiig	University of Oslo, Natural History Museum, NO-0318 Oslo

'Door knockers'

As an aid to single out relevant 'door knockers' the experts have used species lists and information compiled by the European Network on Invasive Alien Species (NOBANIS) and DAISIE European Invasive Species Gateway (see reference list for internet links). Only species with a known ecological impact have been prioritised. Therefore, not all 'door knockers' are assessed. An example of species defined as 'door knockers', but which have not been treated, are aquarium fish. An overview of aquarium fish which are potential 'door knockers' is found in Appendix 5. The number of alien species and 'door knockers' treated and assessed by each group of expert is shown in table 6 in the "Results" chapter.

Species which do not reproduce in Norway

According to the definition of an alien species, the species occurs outside its native extent of occurrence and its natural expansion potential, and includes all life stages or parts of an individual which has a potential to survive and to reproduce. There are many species which fit into this definition, but which do not reproduce in Norwegian nature. This applies to, for example, a number of species which only occur indoors. The experts have listed these separately as summarised in Appendix 3. These species are not impact-assessed.

Species which are excluded

Some species dealt with in the Norwegian Black List 2007 are not included in this project, because they are not within the definitions and delimitations used in the 2012 assessment. Other species which have been excluded due to these delimitations include species which, for example, other bodies or countries have defined as alien species based upon other sets of criteria, species considered as alien on other grounds than ours, or species believed to have become established before 1800. A list of 72 such species is included in Appendix 4, although the list is incomplete. None of the species in this list have been impact-assessed.

Taxonomy, names and localised information

The NBIC database of species names (see reference list for link to internet) is an officially available catalogue of names for species and species groups, and is the source of names used in this project. The groups of experts may use names which are not approved by NBIC in the criteria documents and in other contexts. The scientific name is always quality-controlled and ought to be used to avoid any confusion. Norwegian names are lacking for many species as naming of species is a dynamic and on-going process.

Species – and subspecies

As mentioned in the introductory chapter, the taxonomic level treated has mainly been the species level. Exceptions have been made for some vascular plants, where an assessment at subspecies level has been allowed due to varied taxonomic practices in international specialist groups. This means that taxa internationally considered as species, may be regarded as subspecies or variants in Norway. Vascular plants with hybrid backgrounds are also included. In the rest of the text all taxonomic levels which are treated as species or taxa are discussed for the sake of completeness.

Areas

It is important to be aware of the various meanings associated with terms "exists in Norway", "observed in Norway" and "reproduces in Norway". The impact assessments are carried out on alien species which are known to reproduce in the country at present or are presumed to reproduce within the next 50 years. The term "observed in Norway" is used in other products and services which NBIC has developed, e.g. the citizen science species reporting system (Species Observations Service). "Observed in Norway" does not necessarily mean that the species reproduces here. "Being observed in Norway" does not mean that a species is automatically subject to assessment, as the species must first reproduce in Norway. Svalbard is included as part of Norway, but is a special case, being located far from the Norwegian mainland and with an arctic flora and fauna. Separate assessments have been made for vascular plants and mammals in Svalbard. This has been done to highlight species alien to Svalbard, but which are often native on the mainland. This also applies to other species groups, although for many of these the knowledge base is not sufficient enough to carry out separate assessments for Svalbard. *Echinococcus multilocularis* is an example of a species which is present on Svalbard, and which is considered as a 'door knocker' on the mainland.

Comprehensive information available on the internet

NBIC has prepared a database in which the experts have documented their knowledge of the species and carried out the impact assessments. In this way species information and the basis for the assessment are made available for assessments in the future. Species information, conclusions and criteria documentation have been prepared

Anthriscus sylvestris – an example of a well-established alien vascular plant in Svalbard

Photo: Inger Greve Alsos.

to allow a search on NBIC's web sites, and include considerably more information than is found in the printed product *Alien species in Norway – with the Norwegian Black List 2012*. Information regarding vectors which spread species, as well as which habitat type species are found in, and potentially may spread to, are also included in the database available on the internet. Any potential future corrections and changes to the species data associated with alien species will be made available on NBIC's web sites.

Localised information

The experts have used localised information from the NBIC services Species Map Service and Species Observations Service (see reference list for links) to gain an overview of the histories of spreading for species in Norway. Information from these services has also been useful for estimation of species lifespan, velocity of spread and changes in distribution. The individual knowledge the experts have about species, together with data from museum collections and various publications have helped to complete the picture such that the alien species are presented with quality-controlled distribution. The distribution of alien species is presented on the web sites of NBIC.

Vascular plants and adaptation of methodology

The impact assessments or set of criteria are based upon concrete or estimated data. In cases where there is a lack of such knowledge, then allowance is made use to qualified estimates based on the experience of the experts. Criteria B_2 and B_3 – covering increase in occupied area, and increase in single occurrences respectively (see chapter "Methods and set of criteria") are only used by the expert group for vascular plants. This is an approach for the further development and refining of the set of criteria, see chapter "Looking forward".

A total of 315 vascular plants are placed in the category NK – no known impact – after having been subjected to a qualitative impact assessment. These species are not prioritised in a quantitative assessment, but are qualitatively assessed in accordance with the following guidelines: (1) they reproduce in Norway, (2) their expected lifespan along the invasion axis (which is low owing to few individuals and populations, and no known increase and expansion), and (3) they are not known to cause harmful ecological effects (ecological effect axis). Even though these species have not been thoroughly assessed, it has been decided to present them within an impact category as there is information available about the species and expert knowledge which support these assessments.

State of knowledge – a challenge

The set of criteria are adapted to deal with all taxonomic groups and give comparable results regardless of place, time and species groups. In addition, the methods reveal where the experts do not have sufficient quanti-

fied information in order to carry out well-documented and quantitative impact assessments. The background information for the assessments is the main challenge in order to assess the impact based upon the new set of criteria. If the background knowledge is poor and there is a lack of information, then qualitative assessments based on the precautionary principle are used in addition, which means that the highest possible outcome is used in deciding the impact-categories. The better background knowledge, the better and more reliable is the impact assessment. To what extent the experts' assessment is based upon quantitative data or qualitative estimates, or a combination, is indicated in the species assessment documentation. This is of significance in interpreting the results.

The groups of experts' assessment of background knowledge

The state of knowledge varies between species groups. The evaluation of their respective background knowledge by each expert group is presented below. The experts may also go into greater depth regarding the number of species which are treated, which way of working is used and important variables for the assessments. It is also important to be clear regarding some species groups being split between the expert on marine invertebrates and expert group on terrestrial and freshwater invertebrates. This applies to the species groups Mollusca, Crustacea, Annelida, Porifera and Bryozoa.

EXPERT GROUP ON ALGAE

Vurderinger av fremmede alger ble i dette arbeidet Assessments of alien algae were limited to alien benthic macroalgae (Rhodophyta, Clorophyta and Ochrophyta). Most of the species in these groups are marine species, although some freshwater species are also included. Several alien microalgae have also been recorded in Norwegian coastal waters, although these have a planktonic way of life, with strong seasonal variation and unpredictable occurrence. The criteria upon which alien species are assessed include expected lifespan in Norway as well as establishment and occurrence in different habitat types. It was considered to be very difficult to use these criteria for planktonic microalgae. No attempt has been made to assess any possible alien algae in Svalbard.

The group of experts have, in addition, carried out thorough assessments of macroalgae which are described as being cryptogenic species (i.e. we cannot determine the natural origins with certainty, and the species may prove to be either native or a species that has spread spontaneously rather than being alien). Most macroalgae in this group are algae which are found further south in Europe, and which have since been found in Norway. It is therefore uncertain whether a species is newly recorded because it is rare and easily overlooked, or because it has expanded its' range due to anthropogenic influence.

A thorough evaluation has also been carried out regarding which macroalgae might be considered as 'door knockers' (i.e. alien species which may spread to Norway). Macroalgae which have been recorded as introduced to Europe and which now occur either in, or north of, the Bay of Biscay (but which are not yet recorded in Norway), are considered as potential 'door knockers'. To make an extensive supplementary list of 'door knockers', the European Invasive Alien Species Gateway (DAISIE) was used, and in addition information was also gathered and quality-controlled using AlgaeBase and a literature search in the ISI- Web of Knowledge-database (see reference list for links).

In total, the list of alien benthic macroalgae comprises 30 species. Of these, two are considered as being cryptogenic in Norway, 19 are 'door knockers', and 9 are alien species in Norway. Only 9 of the macroalgae which are

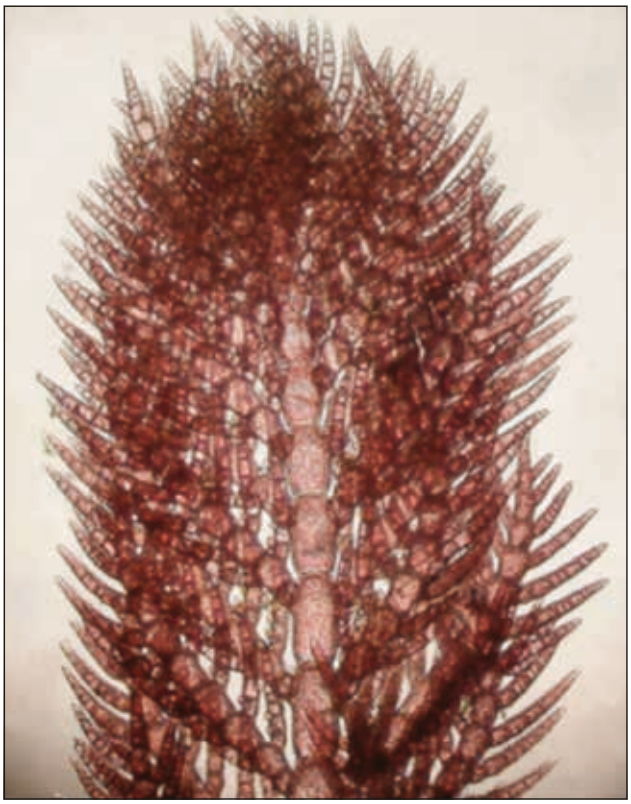

Photo: Vivian Husa

Antithamnion nipponicum – an example of an alien alga found in Norwegian waters

identified as alien in Norway are assessed in this project. The basis for assessing the impact of alien benthic macroalgae in Norway is considered to be inadequate, and many of the assessments are carried out based upon assumptions. Observations reveal that some alien macroalgae are very common and are dominant in places, although there is very little knowledge available regarding the ecological processes that promote or limit the distribution of alien macroalgae. There is also little knowledge as to what effects alien macroalgae have on native species.

EXPERT GROUP ON FUNGI

Background knowledge for assessing the extent of expansion and invasive potential for introduced species of Fungi is very limited. It is often estimated that we know about 10% of the occurrences in Norway today of partially known macrofungi, including Red List species (see Kålås et al. 2010) (i.e. a level of uncertainty x10). Among assessed harmful alien microfungi, knowledge is limited almost entirely to those affecting cultivated plants. This might involve recording of epidemics of cultivated plants in garden centres, cultivated fields, gardens and parks. Usually, less focus is directed towards the spreading of such fungi to wild plants. We need more knowledge about spreading history "into the wild" for such species, for example about how microfungi such as *Glomerella acutata* (syn. = *Colletotrichum acutatum*) is spread in nature. This is a well-documented, newly introduced harmful species on *Fragaria* x*ananassa* in Norway, although we know little about the extent of spread to wild host plants such as *Fragaria vesca*, *Sorbus aucuparia* and *Prunus padus*. Corrispondingly we know much regarding the extent of planting of *Larix decidua* and its faithful companion species *Suillis grevillei* in gardens, parks and such like in Norway. We know much less, however, about the spread of naturalised *Larix decidua* and the associated *Suillis grevillei* in Norwegian nature.

It is only exceptionally that we have good documentation of the spreading history of alien species of fungi. The most striking example is perhaps the history of *Hymenoscyphus pseudoalbidus* which causes serious damage to *Fraxinus excelsior*. It was first recorded in Norway in 2006 and its subsequent spread has been followed and closely documented (Solheim et al. 2011). The damage it causes (ash die-back disease) has resulted in *Fraxinus excelsior* becoming included on the red list (Kålås et al. 2010).

For difficult/little known groups of (small) macrofungi as well as most non-pathogenic microfungi our knowledge is in general much less, often with an probable level of uncertainty of >x100. These species groups are in practice not impact-assessed. A problem with the background knowledge for those species that are assessed is that we have very little data from the same locality over a period of time. Evaluation of development over time must therefore almost always be based upon uncertain, common sense assessments of regional data, with very uncertain calibration of the collection efforts in different areas at different times.

The possibilities to assess the effects of the alien species upon Norwegian species and habitat types are in contrast somewhat better, as we often have good knowledge about in which habitats the species occur in. Many of the fungi species which are introduced to Norway / northern Europe in recent times are more or less host-specific, often parasitic species, and we usually have knowledge about which native species they parasitise or can be expected to parasitise. Within the parasites we can say that there are three main groups of species; (i) those which primarily parasitise and are often imported with cultivated plants, but which may spread to native species, (ii) those which primarily affect native species, and (iii) those which only affect imported species and "are along for the ride" where these imported host plants become naturalised. *Glomerella acutata* is an example in the first category, *Hymenoscyphus pseudoalbidus* and *Erisyphe alphitoides* the second, and *Suillis grevillei* is an example in the third category. In addition we have a category with species which are spread in man-made environments. Some mushroom species, such as *Agaricus xanthodermus* and *A. bitorquis* are examples of such species where we have a fairly good knowledge base regarding which habitats they prefer.

The data sources for knowledge used are The Norwegian Mycological Database (NMD) and the Species Map Service. These sources include data on recorded/collected occurrences of fungi species from most Norwegian herbaria and institutions, as well as data on mainly pathogenic species from the herbaria of the Norwegian Institute for Agricultural and Environmental Research and the Norwegian Forest and Landscape Institute. In addition, various publications contain a lot of data, especially in terms of introduction and spread of fungal diseases.

EXPERT GROUP ON MOSSES

There are no Norwegian studies on what effects alien mosses (Anthocerotophyta, Bryophyta and Marchantiophyta) have on Norwegian habitat types. Assessments of the effects of alien species are therefore based upon

knowledge from abroad, and it is assumed that similar effects apply to Norwegian conditions. Regarding the history of spreading in Norway we can present a rough picture on a rough scale, although more detailed knowledge about the alien species will enable a better picture to describe the spread locally. Spreading history in Norway is based upon data from the Species Map Service. All occurrences of alien mosses have to date been documented by collection of specimens. As there is little attention to alien mosses it is difficult to provide a good estimate of population size and velocity of spread. In calculating population size a level of uncertainty of 10 has been used, at the same time as local population sizes have been assessed for each individual species. It is assumed that the established species will not disappear. They occur in habitat types which will probably exist for an indefinite period, but that need not necessarily apply to other moss species that establish themselves.

In order to improve the knowledge base for future assessments of alien mosses, special focus ought to be directed towards which ecological effects these have on Norwegian nature. It is known that *Campylopus introflexus* has negative effects upon native species in, for example, The Netherlands (Klinck 2010). Studies ought to be implemented on this species in Norway to look at what effects it might have, as its largest occurrence is in coastal heath which is a threatened habitat.

EXPERT GROUP ON VASCULAR PLANTS

For many species groups a *lack* of knowledge is typical for alien species. This is despite the fact that vascular plants (Magnoliaphyta, Pinophyta and Pteridophyta) have a *unique* starting point with documented collections with information on date and place in Norwegian, gathered over a couple of hundred years. These specimens are also accessible for later checking of identification. In total, a little over 97 000 such specimens have been used to evaluate the 1 760 species we have recorded as alien species, i.e. a mean of 55 samples per species. Almost half of the species are known from only one or a very few findings, whereas for the remaining half there are up to 100 separate samples per species.

We have mainly used herbaria data as a starting point in work on impact assessments of alien species. We have only exceptionally relied upon Norwegian literature (for which there is little or nothing for the majority of our species) or information from abroad on how the species behaves there. In a few cases we used supplementary data from the Species Map Service and other digitalised sources of species data (checklists and such like), although these data are not normally possible to recheck. Even though data on collected vascular plants represents a large data source it is not without its limitations:

a) *Species not suitable for pressing.* Some groups are generally poorly documented in herbaria. This applies in particular to coniferous trees, but also some succulents (e.g. Crassulaceae), large plants which do not fit in a plant press (e.g. *Heracleum* spp.), and very thorny plants (e.g. *Rosa* spp.).
b) *The charm of novelty.* Alien plants are often collected the first time they are found in Norway, although rarely subsequently. This is adjusted for as best as possible with values for level of uncertainty.
c) *Regional variation in collecting intensity.* Collect intensity varies geographically. As an example, very little has been collected from Vestlandet in recent decades, and this may give a distorted picture as to where and when the various alien species occur in the country. At the other end of the scale are special studies of garden plants – planted and naturalised – in the Agder counties over the last couple of decades (by P.A. Åsen et al.), of weeds in the inner parts of

Photo: Kristina Bjureke

Phedimus hybridus – an example of an alien plant species not suited for pressing.

Oslo city in the period 1969-1970 (by J.T. Hovda), of all vascular plants with detailed localisation in several municipalities in the period 1985-2010 (e.g. Engerdal, Lier, Drammen, Farsund), and of alien plants in particular, especially in two towns in northern Norway (Harstad and Tromsø) in the period 2000-2010. Some species have been the subject of specific studies (c.f. articles on alien plants by Elven and Fremstad in Blyttia: Fremstad & Elven 1996, 1997b, 1998, Elven & Fremstad 1996, 2000).

d) *Chronological variation in interest.* The interest in alien species has varied over time. Two periods with relatively low interest – 1920-1940 and 1960-1980 – have in particular resulted in little collecting.

Although data from collections provides a good deal of information on the occurrence of the alien species, we have relatively little knowledge as to what ecological challenges they might present. This applies in particular to species that have arrived relatively recently and which in general will be easier to assess. The species which we know the ecological effects of, are typically those species for which we are already too late to be able to implement measures which can prevent further spreading (e.g. *Lupinus polyphyllus* and *Heracleum persicum*) or almost too late (e.g. *Picea sitchensis*, *Elodea canadensis*, *Cotoneaster* spp., and *Amelanchier spicata*). The hope of being able to adapt international data about alien species to our own conditions for all those species for which we lack knowledge of is rather unrealistic. The exception is where there is data available from neighbouring countries which suggests that a species is aggressive (invasive). Then there is every reason to be cautious towards that species here as well, although for most of these species we already have data from Norway. Data relating to how a species behaves in North America or in France can only be adapted to conditions in Norway to a limited degree, firstly because Eurasian plants which have been brought to North America have been shown to be more invasive than they are here, (e.g. *Lythrum salicaria* and *Frangula almus*) or vice versa (e.g. *Solidago canadensis* and *Elodea canadensis*), and secondly because experiences cannot be transferred between different climatic and light-climatic areas (e.g. between France and Norway). An alien species in Norway is native somewhere else and often has a different ecology in its area of origin. Whether a species establishes itself or not will largely depend upon circumstances associated with where it arrives and which ecological niches are available. For example, it took *Hordeum jubatum* and *Lepidium densiflorum* almost 50 years from being imported with ballast soils to a few coastal towns before these two species reached a suitable continental area in Gulbrandsdalen where they became naturalised.

For a large extent we need to rely on data which is collected for other purposes. Collections directed especially towards impact assessments should be supported by own research projects which may have as goal to examine a handful of species thoroughly through demographic studies. How data ought to be gathered is therefore related to which analysing methods one intends to use for the data. Pure demographic studies will make the methods developed by Centre of Conservation Biology (Norwegian University of Science and Technology, Sandvik et al. 2013) more usable, although such studies are so time-consuming that it is not realistic for more than a few species, hardly for more than a maximum of 10 of the ca. 800 alien species of vascular plants which have become established or might be about to establish populations in Norway.

The group of experts are of the opinion that herbarium data containing dated and localised specimens represent a good knowledge base, and that the way forward is to improve these data. Digitalisation of herbarium data is very important. This is completed for all of the national herbaria apart from Oslo, where about 30-40% still remains. Geo-referencing of the same information is necessary such that they can be fully utilised, and this is in particular lacking in the herbarium in Bergen (almost 90% of the information is without coordinates). We can also encourage collectors to provide an approximate population size for occurrences of the species of which they collect specimens, although we cannot force anyone to do so. Those who contribute most to the collections in the Oslo herbarium are competent amateurs (almost 50% of the annual collections), and this work has been done in their spare time. The efforts of amateurs have however been less important for the other herbaria. Regardless, collections will always be characterised by personal preferences and motivation to collect. We cannot expect people who collect material for the herbaria to collect material for a project such as this. Thus, it can be difficult to propose guidelines as to how they collect material. Rather, it should be taken into account what type of data already exists when the methodology is developed.

Herbarium data is a suitable starting point for further improvements of both methodology for calculating spread velocity developed by CCB, such that it does not give extreme results for a few, incidental events, and of the PVA method (Population Viability Analysis) developed by Olav Skarpaas and Odd Stabbetorp of the Norwegian Institute for Nature Research (NINA)

based upon data on occurrence (Skarpaas & Stabbetorp 2011). The PVA method was originally developed for red list species in decline. The results from using the method on alien species suggest that this method cannot be directly transferred to species which are increasing. The population-growth model which forms the basis of this method ought to be adjusted and adapted to be better suited for alien species, and ideally one should be able to choose between different models. After all, the alien species do not all behave in the same way.

EXPERT GROUP ON MARINE INVERTEBRATES

The group of experts has dealt with marine species within the species groups Porifera, Cnidaria Ctenophora, Annelida, Crustacea, Pycnogodina, Mollusca, Bryozoa, Brachiopoda, Echinodermata, and Tunicata. Brackish water is considered as part of the marine environment. Species which occur in brackish water, and in some cases both brackish and fresh water, are therefore treated by this group of experts. This applies for a number of species which are introduced to the Baltic area and which spread in estuaries and water-bodies in Sweden and Finland and with the possibility of reaching Norway. *Eriocheir sinensis* whose larvae develop in the sea, but which otherwise lives in fresh water, has been impact-assessed by the group of experts on terrestrial and freshwater invertebrates, owing to its ecological effects in fresh water.

In general, basic knowledge on alien marine invertebrates in Norway is poor. With the exception of a few species, there is today no functional reporting system which addresses new observations. There is no central register of observations. The most important sources of data are project reports, institutions own databases and registers, as well as observations from individuals. Knowledge about species from abroad have been gathered from international databases (NOBANIS, DAISIE, Baltic Sea Alien Database), national overviews from, for example, Sweden (web-site on Främmande Arter i Svenska Hav), from Germany (Gollasch & Nehring 2006) and from Great Britain (web-site of Joint Nature Conservation Committee - JNCC), in addition to a number of scientific articles.

Many species are taxonomically difficult and need to be controlled by specialists to confirm identification. This probably results in many species being underreported or perhaps completely overlooked. A frequently recurring problem is that reports of new findings cannot be verified (for example due to lack of documented individuals). Due to this, it is suspected that the data available for many species is uncertain and lacking. In the current project only confirmed findings are considered.

Localising can also present challenges. This applies in particular to species which spend parts or the whole of their lives in the open waters, where changes are very dynamic and can cover large areas of sea in a short space of time. Localising of planktonic species is often of little value in terms of later verification of findings and for calculating spread velocity. For bottom-dwelling species, locations are often imprecise, particularly for older observations. This can make it difficult to determine under what conditions an observation is made in. In many cases local environmental conditions determine whether a species can establish permanent populations.

Information is good for a few species which are the subject of on-going monitoring or which there is special attention towards. This applies to *Paralithodes camtschatica*, *Chionoecetes opolio*, *Crassotrea gigas*, *Homarus americanus* and *Eriocher sinensis*. For these species routines will be established for monitoring (e.g. *Paralithodes camtschatica*, *Chionoecetes opolio*) or routines for reporting (e.g. *Homarus americanus*). In addition, regional studies have newly been carried out for specially selected species using so-called rapid assessment survey techniques which provide good data for the species which are included.

Perhaps the most important single measure which can improve the knowledge base is to provide systems for joint reporting and recording of obervations. Routines must also be in place for validation of observations to ensure that data is reliable.

For treatment of marine 'door knockers' the area considered has been limited to the west-European coast from the Bay of Biscay to the North Sea, the Baltic Sea area and the Kattegat, in addition to the Russian part of the Barents Sea. Particular emphasis has been placed on species which have shown large dispersal and which have the potential to become established in Norway. The impact assessments are mainly based upon data in literature, although direct contact has also been made with specialist groups and other persons with relevant information.

EXPERT GROUP ON TERRESTRIAL AND FRESHWATER INVERTEBRATES

The group of experts have dealt with species in the groups Porifera, Collembola, Coleoptera, Hemiptera,

Photo: Arnstein Staverløkk

Harmonia axyridis – an example of an alien beetle in Norway.

Orthoptera, Blattodea, Dermaptera, Lepidoptera, Diptera, Hymenoptera, Myriapoda, Arachnida, Crustacea, Annelida, Mollusca, and Bryozoa. Assessments are built upon a collation of available knowledge on these species in Norway. An important source of data has been the Norwegian Black List 2007, as well as the databases Fauna Europaea, DAISIE and NOBANIS (see literature list for links). The publication "Alien Terrestrial Arthropods of Europe" (Biorisk 2010) has been of great help for finding basic knowledge on what species ought to be assessed in Norway. Otherwise, the most important sources of data are articles, notes, reports etc. from Norway, both published and unpublished. In addition, data has been gathered from the Species Map Service, internal databases (e.g. Leparb´s, Biofokus' and NINA´s observation databases), insect collections in museums / institutes, other available sources and not least our own experience. Small and unavailable publications have been a great challenge. Some information has only been available in foreign literature, something which has often been difficult to apply to Norwegian conditions. Some information has also been found to be erroneous. This applies in particular to internet-based overviews on species distribution.

Assessment of the ecological impact associated with alien species requires a very good knowledge base, something the methodology takes into account. The big challenge in the case of invertebrates, both terrestrial and in freshwater is, however, that the knowledge base, even for the best studied species, is nowhere near satisfactory enough that one is able to come to convincing conclusions related to ecological impact.

Lack of knowledge is thus a recurring challenge across all species groups and has been the greatest limiting factor in this work. One would have expected that several groups which are important in basic and applied ecology would have been satisfactorily studied, but this is only exceptionally the case. In the case of terrestrial and freshwater invertebrates very little has been done towards collecting systematic knowledge on the dynamics and distribution of alien species both internationally as well as in Norway. Noticeably many of the species observations which are documented originate from few, scattered and incidental observations in time and space, something which results in the assessment in most cases being very incomplete. There are big knowledge gaps regarding the whole establishment and expansion stages for most species, including species which are spread in relation to trade between greenhouses and nurseries and then outdoors. In other words, there is a strong need for purposeful mapping and monitoring of alien invertebrates in Norway.

EXPERT GROUP ON ROUNDWORMS AND FLATWORMS

No systematic work to map the occurrence of Platyhelminthes and Nematode exists in Norway, either for native or alien species. The exception is the alien parasitic flatworm *Gyrodactylus salaris* which causes high mortality in salmon populations. The knowledge base for assessing the impact of alien species in these two groups is very small and incidental. There are some simple data in a very few publications, although impact assessments must mainly be based on the knowledge and experiences of individual researchers. Even though many species of roundworm and flatworm have great ecological and economic consequences and are of interest to many, data collection can only be done by experts. In Norway the specialist circles are small, and these have limited possibilities to obtain good datasets. Due to data on the occurrence of roundworms and flatworms in Norway being basically poor and that mapping activity

is almost non-existent, the possibilities of discovering alien species coming into the country are limited. It is likely that several species have established themselves and will establish themselves in the country in the near future, but without them being discovered. The exceptions are likely to be flatworms and roundworms which have large negative ecological or economic consequences. A systematic mapping and monitoring programme would rapidly improve basic data, although such projects are relatively expensive. A good start would be to gather and systemise all existing knowledge in various forms of publication including grey literature (master's theses, reports that are not part of series, web sites, newspaper articles etc.). In addition, many researchers have much unpublished data both in their heads and their offices.

It has been a challenge for the group of experts to assess in which habitat types species are found. The group of experts consider information to be limited, e.g. for aquatic parasites compared to recording possibilities for wild animals and plants. It has also been a challenge for the expert group on roundworms and flatworms to assess which ecological effects the effects of disease might have on these groups of species as the organisms themselves can often be the host bearing the disease. The experts on roundworms and flatworms often use the term "vector" for the host species the parasite lives on / in. In relation to this we have chosen to use "host" to avoid confusion in terminology used.

EXPERT GROUP ON FISH

For marine fish ('Pisces') an assessment was first made of the 97 species which, during assessments for red-listing in 2010, were categorised as "not applicable" (NA), "not evaluated" (NE), or with uncertain categorisation due to being "data deficient" (DD) (Kålås et al. 2010) and as to whether these were alien species. None of these species were considered to be introduced by humans, and they cannot therefore be defined as alien species in Norway.

Only one marine fish species, *Glossanodon leioglossus*, is believed to have come to Norway with the aid of humans, although quite how is unknown. Only a single full-grown specimen has been found with certainty in Norway, in Sognefjorden in 1942. Since then, the species has not been observed, and we can assume it has not established itself or spread to Norway. The impact of the species has therefore not been assessed.

For marine species of fish only 'door knockers' have been impact-assessed. This comprises five species which are observed in our neighbouring countries and/or countries around the North Sea after having arrived with the aid of man. These 'door knockers' are impact-assessed in relation to possible spreading into Norwegian waters and the ecological influence they would then have upon Norwegian marine fish fauna. These species are: *Anguilla japonica*, *Anguilla rostrata*, *Neogobius melanostomus*, *Micropogonias undulatus* and *Sebastes schlegelii*. The most important sources of data for these assessments are reports and publications and information exchange between European researchers. Invasion potential (expected lifespan and spread velocity) was considered using a precautionary principle, as statistic methods for calculation could not be used (quantitative data was largely lacking). The internet pages DAISIE European Invasive Alien Species (NOBANIS: see reference list for links) has been of great help to gain an overview over potential 'door knockers'.

In addition to the five 'door knockers' mentioned, *Coris julis* should also be mentioned. This marine species of wrasse lives naturally as far as the southern part of the North Sea and the Kattegat /the Sound and can therefore not be defined as a 'door knocker'. However, it has been considered to import this species to delouse farmed salmon in fish farms along the Norwegian coast. An import could lead to the species becoming established in the Norwegian fauna, leading to the need to assess the impact of spreading and ecological influence of this species.

Glossanodon leioglossus – the only marine fish species believed to have arrived in Norway with the aid of man.

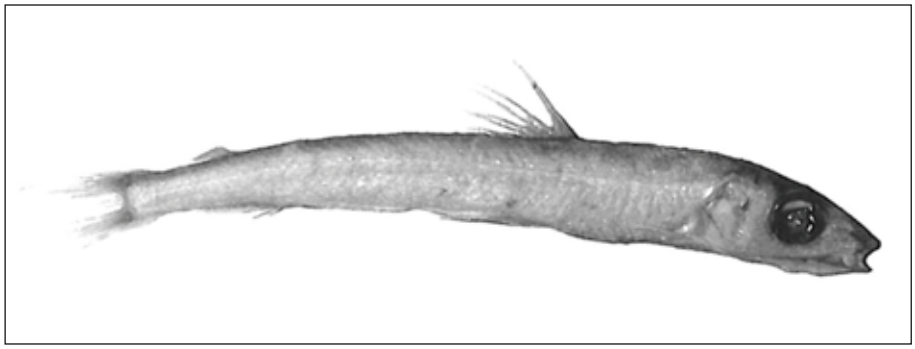

Photo: Ingvar Byrkjedal

A list has also been made of all alien marine aquarium fish occurring in Norway, based upon replies from Bergen Aquarium, Drøbak Aquarium, Polaria and Ålesund Aquarium (Atlanterhavsparken). Of these four, only Ålesund Aquarium (Atlanterhavsparken) and Bergen Aquarium have species which do not belong to the Norwegian fauna (Appendix 5). These species are mainly tropical and the chances of establishment/expansion can be considered to be very small. Such a list is considered to be useful documentation if these should escape and for documenting future changes in the natural diversity of fish.

In the case of freshwater fish, good documentation exists as to which alien species are found in the country. In total 10 species which have established permanent populations have been assessed, all introduced after 1800. Knowledge of their geographical distribution is good. There is also a good deal of data as to when the individual species were imported. In addition to these 10 species, *Cyprinus capio* is also an alien species in Norway. It was however established before 1800 and its impact is therefore not assessed.

When considering 'door knockers' among freshwater fish, the group of experts have considered those species that are found in our neighbouring countries of Finland, Sweden and Denmark. This involves a total of 11 species. The risk of spread into Norway is for some species caused by small size and bait use, whereas others attain a size making them interesting as trophy species. With today's communication possibilities with camper vans etc., there is also a risk that anglers from other European countries can bring with them alien fish species from their home range. If such a potential had been included in these assessments the list would then have been even longer. We have therefore limited 'door knockers' to include only those found in our Nordic neighbouring countries. An overview of aquarium fish which are potential 'door knockers' can be found as an appendix (Appendix 5).

EXPERT GROUP ON AMPHIBIANS AND REPTILES

The knowledge base for assessment of herptiles (Amphibia and Reptilia) is based upon many years of recording of species occurrence, published articles, newspapers, own observations and studies, as well as incoming information to the Museum of Natural History and Archeology at the Norwegian University of Science and Technology. However, there are probably several additional cases of introductions, although these are probably of no significance to the assessments. The list of alien herptiles treated comprises only five species. In the case of *Rana* kl. *esculenta*, we have pretty solid data relating to expansion, number of individuals and habitat. Three of the other species on the list (one frog and two turtle species) are found more sporadically and have not gained a foothold in Norway. Even so, it can be important to gather information on observations in the wild of these and other alien species, not least form newspaper articles; newspapers are rather keen to write about introduced and escaped terrarium animals. Herptiles as hobby animals are forbidden in Norway under the Animal Welfare Act (Ministry of Agriculture and Food 2009), although today herptiles are smuggled into Norway on a large scale. A softening of the law is however underway, something which may allow the keeping of some species of herptiles – including species which could thrive in climatically suitable places in Norway. One must therefore expect the number of introduced species / escaped terrarium animals to increase.

EXPERT GROUP ON BIRDS

Work on impact assessments of alien bird species (Aves) has involved 61 species. All of these species are observed in a wild state in Norwegian nature. Of these 38 species are considered unlikely to reproduce in Norwegian nature in the next 50 year period, and these are therefore not impact-assessed. The impact of *Branta leucopsis* has not been assessed. This species was formerly considered as an alien species in mainland Norway, but appears now to have established a naturally occurring population. Moreover, "Feral pigeon" is not assessed. This is a variant of *Columba livia* which was imported by humans into Norway before 1800. We have had wild populations of feral pigeons in Norway, although this population is now extinct (Kålås et al. 2010). In addition to the 61 species covered, a number of species are kept in captivity, but these are not observed living wild in Norway. This applies mainly to cage birds or park birds, and in the case of northern Europe probably includes hundreds of species (Gjershaug 2012a, 2012b). For all of these species the current situation means it unlikely that they will establish wild populations in Norway during the coming 50 year period, and no further impact assessments have been made for these.

The selection of species which are included in this work are based upon the overviews presented in 33 publications from the Norwegian Rarities Committee (NSKF) which mainly covers observations from ca. 1970 to 2008 (http://birdlife.no/organisasjonen/nskf, latest

Branta canadensis – an alien bird species which is numerous in Norway.

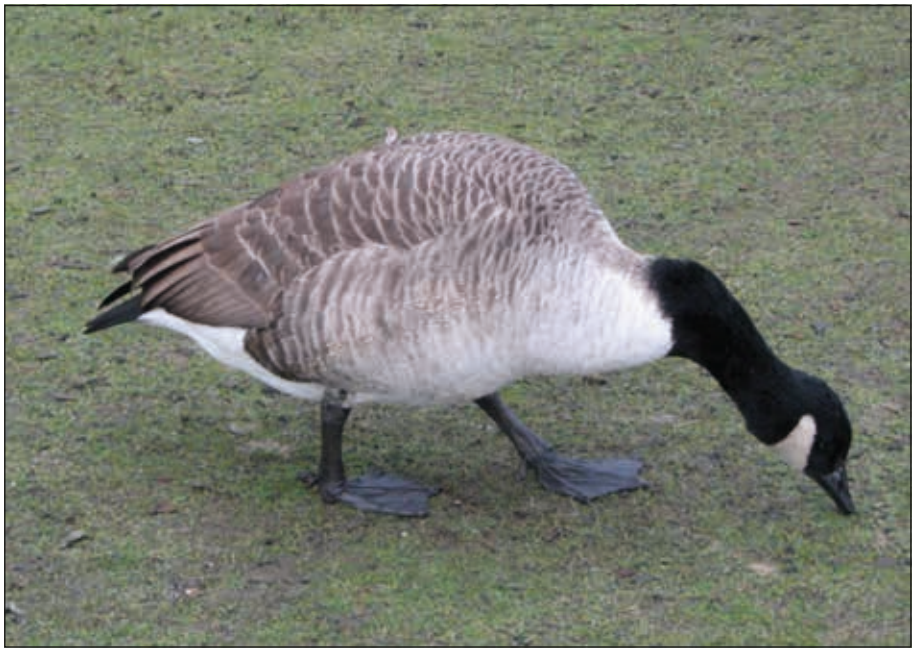

Photo: Jan Ove Gjershaug

report Olsen et al. 2010). Observations of rarer species occurring in Norway are presented here, and these are also evaluated as being either native or alien. For some species additional information has been extracted from Bevanger (2005), and in addition we refer to species-specific references given in the criteria documentation for each species. For some bird species the possibilities of introgression or hybridising between alien and native species are a central point in terms of ecological impact assessments. In relation to this information from McCarthy (2006) has been used.

We consider today's knowledge on alien bird species in Norway to be good. Birds are however very mobile and move between breeding, migration and wintering areas.

In theory, ecologically harmful effects may occur both in the breeding area (e.g. displacement of, or hybridising with, other species and by influence upon habitat types) and in migration and wintering areas (e.g. increased spread of disease, displacement of other species and influence upon habitat types). For such species there is therefore a need for knowledge about their breeding, migration and wintering areas. County-wise data for each species indicates which counties a species has been observed in, regardless of season or year. Yet such data cannot indicate where breeding populations have become established. We expect that the routines for quality control of observations in the Species Observations Service currently being established will provide a more solid basis in the future both for individual observations, as well as for any establishment and spread of alien species in Norway.

In the case of alien bird species which are numerous in the wild in Norway we only have one species, *Branta canadensis*. We have a good amount of information on the establishment and expansion of this species in Norway, although little of this information has been collated and analysed e.g. in terms of spread velocity. There is no updated information regarding population size, we know little about the species current expansion into new areas, and no assessment has been made as to how much of Norway is a potential breeding area. The knowledge base is limited to cover which ecological effects the species has in Norway.

Many species, in particular geese and ducks, are known to form hybrid pairs with closely related species (McCarthy 2006). They can often produce fertile offspring (McCarthy 2006), something which forms the basis for introgression. Such hybrids can often arise when single individuals escape from captivity and cannot find a partner of the same species. The possibility for introgression may therefore be present even with a low frequency of occurrence. Introgression in threatened species is possible for the following species: *Anser erythropus*, *Anser fabilis*, *Anas querquedula*, *Aythya marila* and *Mergellus albellus*. With the exception of *Aythya marila* these species are not numerous in Norway, so despite the possibility of introgression then the frequency is expected to be very low.

EXPERT GROUP ON MAMMALS

The knowledge base for alien mammal species (Mammalia) in Norway is mostly good. Mammals are a group

which receives relatively much attention from researchers and enthusiastic amateurs. Biological and ecological factors as well as distribution, population changes and harmful effects are well-documented for most mammal species in Europe, particularly for the larger species. Therefore the expert group can build their assessments to a significant degree upon available literature. Most impact assessments for mammals are well founded.

Comparison between 2007 and 2012

All species which are defined as alien and reproduce in Norway today – or have the potential to reproduce in Norwegian territories within the next 50 years – are impact-assessed and placed in an impact category. The total number of species assessed in the Norwegian Black List of 2007 was 217. Following publication it was discovered that two of these species each were included with two different names. This means that 215 species were risk-assessed in 2007, as opposed to 1180 species in 2012. Even though these figures are not directly comparable due to differences in delimitations and definitions, *Alien species in Norway – with the Norwegian Black List 2012* presents a lot more species which are impact-assessed than previously.

The groups of experts have themselves chosen which 'door knockers' are impact-assessed, and which species in addition shall figure in the list of 'door knockers' (see Appendix 2). Of 203 listed 'door knockers' 134 species are impact-assessed.

National overview of alien species

Five years ago the Norwegian Black List 2007 presented 2 483 alien species in Norway. *Alien species in Norway*

Table 5. Total number of alien species per species group in 2007 compared to 2012.

Species group	Total species / taxa defined as alien in the Norwegian Black List of 2007	Total species impact-assessed in 2007	Total species / taxa defined as alien in 2012
Bacteria	7	3	
Microalgae	11	11	
Macroalgae	10	9	9
"Pseudofungi"	50	8	*
Fungi	242	24	67
Anthocerotophyta, Bryophyta, Marchantiophyta	2	2	2
Magnoliophyta, Pinophyta, Pteridophyta	1 681	25	830
Cnidaria	2	2	3
Ctenophora	1	1	1
Platyhelminthes	20	3	5
Nematoda	60	3	8
Annelida	2	1	2
Crustacea	17	9	14
Myriapoda	11	0	4
Arachnida	21	5	9
Insecta	263	54	142
Collembola			20
Mollusca	32	14	20
Tunicata	1	1	2
"Pisces"	14	21	10
Aves	8	7	21
Amphibia, Reptilia			1
Mammalia	11	14	10
Sum excluding 17 native and propagated species in 2007	**2466**		**1180**
Total alien species observed in Norway which do not reproduce			**1140**
Total native and propagated species	**17**		**0**
Sum alien species in Norway	**2483**	**217**	**2320**

* "Pseudofungi" is included in Fungi, below.

Phyllobius intrusus was first found in Europe in Kristiansand in 2009, and was therefore not included on the 2007 Black List.

Photo: Arnstein Staverløkk

– *with the Norwegian Black List 2012* lists 2 320 alien species in Norway, inclusive Svalbard. For a comparison over the total alien species per species group in 2007 compared to 2012, see Table 5.

The list of alien species in *Alien species in Norway – with the Norwegian Black List 2012* includes 162 fewer species compared to in 2007. The main reason for this is differing delimitations:

- Norwegian Black List 2007 did not have a historic time limit, whereas the groups of experts in 2012 only considered alien species which were recorded or which had begun to reproduce after 1800.
- Norwegian Black List 2007 included native species spread by man's activities within Norway's boundaries (14 species) and propagated native species in Norway (3 species). Such species are not included in 2012.
- Microalgae and bacteria as well as some Nematoda (roundworms) and Platyhelminthes (flatworms), are not included in 2012. Knowledge about microalgae and bacteria are generally lacking. As it was not possible to compile a complete overview of alien species for these groups, as well as to improve the work tasks of the groups of experts, a decision was taken to completely exclude microalgae and bacteria. In the case of Nematoda and Platyhelminthes, those species that were believed to cause most damage are included, although a complete treatment of all alien species in Norway within these two species groups has not been carried out.

In 2012 focus has also been directed towards differentiating between species which do not reproduce in the country or are not expected to do so within the next 50 years. This includes 1140 of the 2320 species in total (see Appendix 3), mostly vascular plants. There are 10 alien species in Svalbard: 9 vascular plants and one mammal. *Microtus levis* is the only species in Svalbard which was impact-assessed both in 2007 and 2012. In addition, several vascular plants are treated (i.e. 69 species), although they are not considered to be able to reproduce in Svalbard.

Acknowledgements from the groups of experts

The expert group on Nematoda and Platyhelminthes wish to thank Inger S. Hamnes (Norwegian Veterinary Institute) for information on terrestrial roundworms in land animals. The expert group on vascular plants have received valuable input from Per Harald Salvesen (University Museum of Bergen), Eva Vike and Ole Billing Hansen (Norwegian University of Life Sciences). The following persons have contributed with information on marine invertebrates: Erling Svensen (Egersund), Pia Norling (Norwegian Institute for Water Research), Temir Britayev (Severtsov Institute of Ecology and Evolution, Moscow), Wim Vader (Tromsø University Museum) and Vera Sandlund (Norwegian University of Science and Technology). The expert group on birds acknowledges Kjetil Bevanger (Norwegian Institute for Nature Research). The following mycologists have also been consulted during this work: Geir Gaarder (Miljøfaglig Utredning), Tom Hellik Hofton (Biofokus), John Bjarne Jordal

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Results

Species that have been treated and assessed

A total of 2320 alien species have been recorded in Norway, including Svalbard (see definitions in Introduction). For almost 3/5 of these (1180) an assessment has been made as to what ecological impact the species may represent in Norwegian nature (Table 6) (see Table 9 for a species overview).

Alien species in Norway – with the Norwegian Black List 2012 also covers 1140 alien species which are not impact-assessed (see "Introduction"). These are species which are unlikely to reproduce in Norwegian nature (within a 50 year time perspective, using the climate prognosis of Førland et al. 2008). This often applies to species observed during their most suitable season of the year, but which will not be able to reproduce outdoors in Norway (e.g. *Phoenix dactylifera*).

Assigning species to impact categories

Norwegian mainland and Norwegian territorial waters

A total of 216 of the 1170 impact-assessed species in this geographical area (hereafter described as Norway) are alien species with either a severe (SE) (106 species) or a high (HI) ecological impact (110 species) (Figure 4). These two categories comprise the Norwegian Black List. The proportion of Black Listed species among all the alien species is around 20%.

In total, 198 species (17%) are assigned to category PH (potentially high impact) (Figure 4). This includes species which either have the lowest level of invasion potential combined with the highest level of ecological effect *or* the highest level of invasion potential combined

Table 6. Total number of alien species recorded vs. number of assessed species

Alien species	Recorded	Impact-assessed
Reproducing species	**1180**	**1180**
Norwegian mainland	1170	1170
Svalbard	10	10
Non-reproducing species	**1140**	**0**
Norwegian mainland	1071	0
Svalbard	69	0

Glomerella acutata
Photo: Erling Fløistad

with the lowest level of ecological effect (see Figure 3 in the chapter "Methods and set of criteria"). Thus, this category includes two groups of species which have completely different types of impact. If unforeseen changes in the environment or species characteristics cause it to expand, then the former group could potentially lead to a large ecological impact. There are only 8 species in this group (category PH – "1,4"), one beetle (Coleoptera) and 7 birds. As many as 190 species have been assigned to the latter group in category PH – "4,1". Species in this group may have a potentially high impact as they may possibly change characteristics and/or properties, and thus may exert potential effects upon native nature (by microevolutionary or epigenetic processes, see the chapter on "Alien species: introduction, establishment and spread"). This group includes, amongst others, 155 vascular plants and 17 species of beetles (Coleoptera), as well as representatives from several other species groups.

Additionally, 393 alien species (34%) are evaluated as having a *low impact* (LO), whereas 363 species (31%) are evaluated to have *no known impac*t (NK) on Norwegian nature (Figure 4). The latter category requires that these species are assessed as having the lowest possible level of impact for all of the nine criteria, in other words no known effects or potential of invasion (50 years in time) according to today's situation. As the assessments for species with no known impact are made on the basis that there is today no documented invasion potential or ecological effect, this category will also include species where there is an insufficient knowledge base. Thus, it is important not to exclude these species from having a potential impact Norwegian nature in the long term. These species should be reassessed during future revisions of ecological impact assessments of alien species in Norway.

Land areas in Svalbard

Alien species in Svalbard are treated separately (see Tables 6 and 7), but are only represented by vascular plants (78 species) and mammals (1 species). Species which are alien in Svalbard may be native species on the Norwegian mainland. In total, 20 species are recorded as being alien both on Svalbard and mainland Norway, yet only one is impact-assessed for both areas (*Barbarea vulgaris*; Svalbard (LO), mainland Norway (SE)). Of 9 impact-assessed vascular plants only *Anthriscus sylvestris* is assessed to have a high impact (HI), whereas the others have either low impact (5 species) or no known impact (3 species). *Microtus levis*, which is the only assessed mammal in Svalbard, is categorised as a low impact species (LO). An additional 69 alien vascular plant species in Svalbard have been observed, but these are placed in the group of "alien species which are considered as unable to reproduce in the next 50 years".

In the statistics, figures and tables which follow, Svalbard is excluded unless specified otherwise.

Criteria and impact on Norwegian nature

Species have been risk-assessed following criteria concerning both invasion potential and the possible or real ecological effect they might have on Norwegian nature. Invasion potential is assessed according to three criteria: A) the expected population lifetime for the

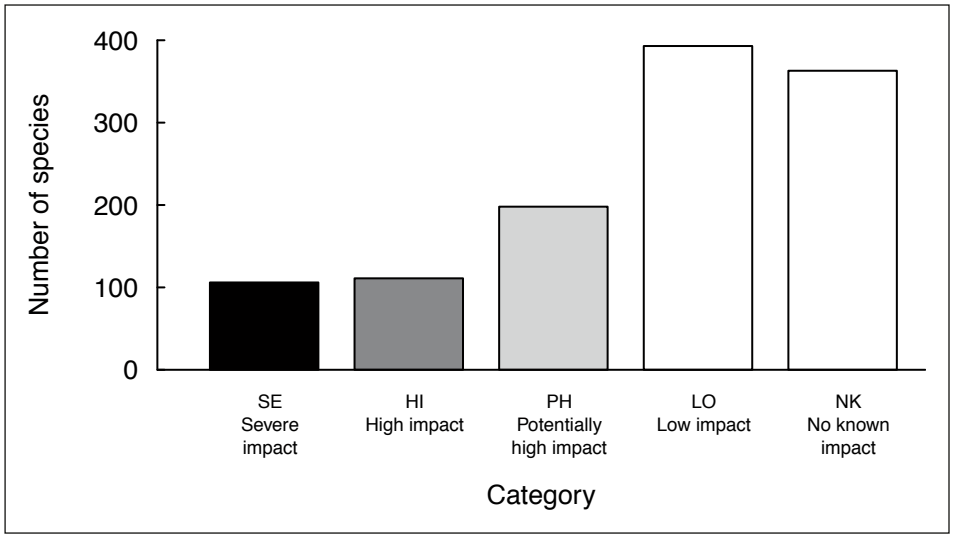

Figure 4. Distribution of number of impact-assessed alien species from the Norwegian mainland and maritime zone (i.e. alien species that may reproduce in Norway) by category. Species assigned to SE and HI are on the Norwegian Black List.

species in Norway, B) Mean expansion rate with sub-criteria B_1 – expansion velocity, B_2 – increase in area of occupancy, B_3 – increase in occurrences, and C) Area of habitat type occupied. Ecological effects are assessed following criteria dealing with the alien species effects upon D) native threatened species / native keystone species, E) other native species, F) threatened / rare habitat types, G) other habitat types, H) the potential to transmit genetic material (introgression) and/or I) the potential to transmit parasites / pathogens to native species. (See chapter "Methods and set of criteria").

It is the highest subcategory specified for invasion potential and ecological effect, respectively, which is decisive for the assessments. As the criteria *expected lifespan* (A) and *expansion* (B) are linked, the final impact category may be lower than each highest specified subcategory alone would tell. Assignment to an impact category is dependent upon a species meeting the requirements of the linked criterion (see Table 2 in the chapter "Methods and set of criteria"). In describing the use of criteria in this section, only the specific indications of the subcategories for each criterion are presented. This is because it demonstrates the explicit assessment for each aspect and the issues that the various criteria involve.

Invasion potential

The assessment of a species **expected lifetime** is what often results in the highest subcategory among the criteria concerning invasion potential (Figure 5a). This criterion indicates the probability of the species becoming established in Norway, and 452 species are considered to be able maintain viable populations in the country for more than 1000 years (subcategory 4). A total lifetime of more than 50 years (but less than 1000) (subcategory 3) is assigned for 249 species, and 79 species are considered to have a lifetime for the whole population in Norway of between 10 and 50 years (subcategory 2).

Estimates of **expansion velocity** (B_1) are given for 691 species, of which 27 are placed in the highest subcategory (subcategory 4), which tell that they have a spread velocity of more than 30 km each year (including both self-dispersal and with the aid of anthropogenic influences). The criterion which specifies expansion velocity is not assigned for all species due to lack of basic data. However, alternative criteria are used for a selection of vascular plants. These assign **increase in area of occupancy** and **increase in occurrences** (B_2 and B_3), and for these sub-criteria a total of 186 species are placed in the highest subcategory. Only vascular plants are assessed in relation to these sub-criteria. Because this group include a very large proportion of all assessed species, then these criteria are frequently used to assess invasion potential (Figure 5a).

Only 14 species have been assigned to the highest subcategory for the criteria of **expected colonisation of habitat type**, that is to say species expected to colonise more than 20 % of the area of occupancy of at least one habitat type in Norway during the next 50 years. Correspondingly, between 10 % and 20 % of a habitat type is expected to become colonised by 21 of the alien species assessed (subcategory 3), whereas 72 species might colonise between 5 % and 10 % of at least one habitat type in Norway (subcategory 2).

Ecological effect

With regard to ecological effects of alien species, a total of 294 species of the impact-assessed species are considered as able to lead to negative influence according to one or more of the criteria along this axis.

A total of 92 species are assessed as having either a genuine or a potential negative effect upon **native threatened species or keystone species**, of which a total of 19 species are placed in the highest level of impact (Figure 5b). These species may thus cause a negative effect on the long-term population growth or cause a significant reduction in the population size of at least one threatened species or keystone species. *Neovison vison* (SE) is a species in this group, as it can displace *Mustela putorius* which is categorised as vulnerable (VU) on the Norwegian red list for species 2010 (Kålås et al. 2010). Another example is the relatively newly arrived alien species *Elodea nuttallii* (SE). This species is considered to have a negative effect upon the population of *Baldellia repens*, a freshwater plant only found at a few locations in Hordaland county, and which is classified as being endangered (EN) on the Red List for species.

Further, 231 species are recorded as having negative effects on **other native species** in Norway. Of these, only 6 species are placed in the highest impact level for that criteria (Figure 5b). In other words, these alien species may influence native species in considerable parts of their distribution area. These alien species are often assigned to subcategory 2, meaning that the alien species can cause small effects upon native species within 50 years (noted for 148 species).

The effects of alien species upon native species due to the potential to transmit genetic material (introgression) and disease / parasites are assessed using specific

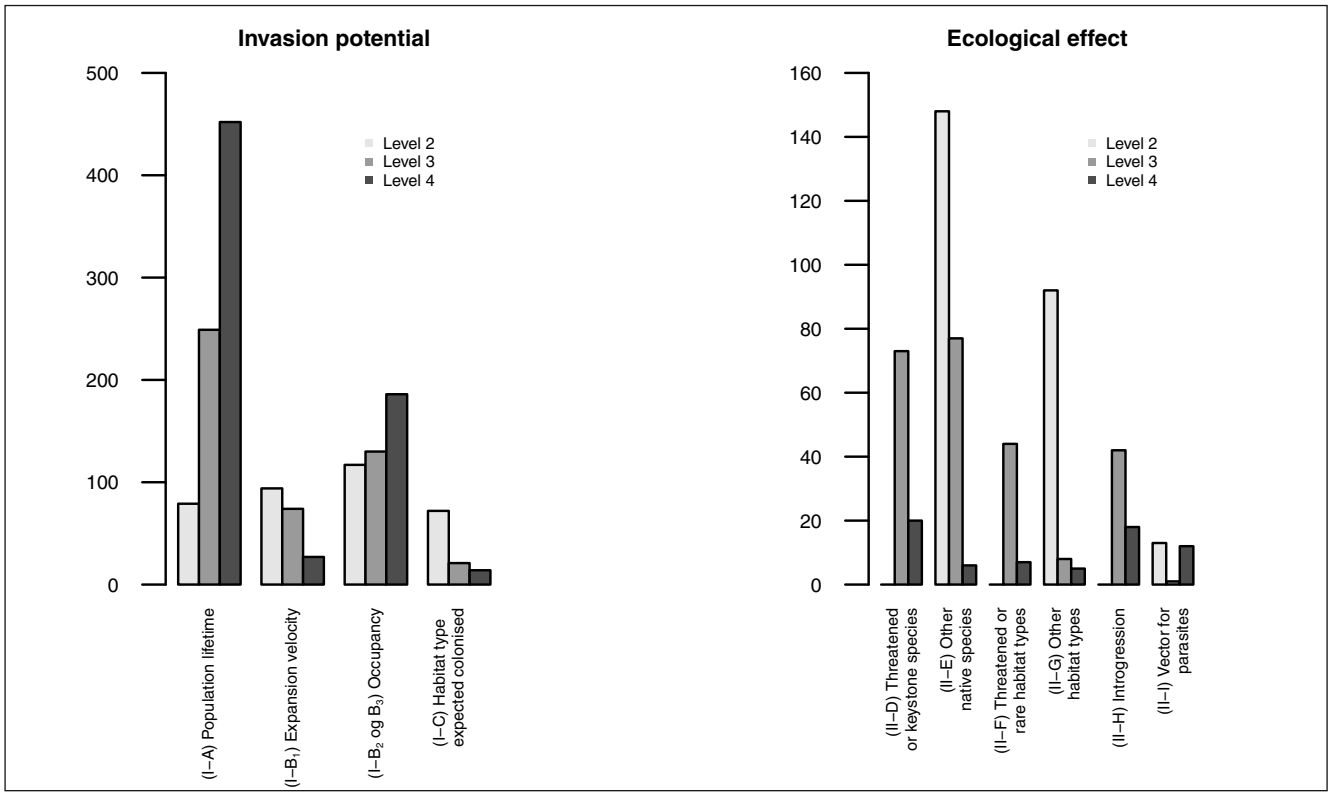

Figure 5a. The figure shows the distribution of given subcategories within each criterion for invasion potential. The invasion axis has 4 criteria: A - Expected population lifetime, B_1 - Expansion velocity / B_2 - Increase in area of occupancy / B_3 - Increase in occurrences and C - Area of habitat type occupied. Each criterion is divided into 4 subcategories that indicate the species' potential for invasion. Only cases where the criterion is considered to level 2 or higher are included. B_2 and B_3 are only used on vascular plants.

Figure 5b. . The figure shows the distribution of given subcategories within each criterion for ecological effect. The ecological effect axis has 6 criteria: D - Effects on threatened or keystone species, E - Effects on other native species, F - Effects on threatened or rare habitat types, G - Effects on other habitat types, H - Transmission of genes (genetic introgression) and I - Transmission of parasites or pathogens. Each criterion has 4 (or 3*) levels (= subcategories). Only cases where the criterion is considered to level 2 or higher are included.

* Level 2 does not apply for criterion D, F and H (see the chapter "Methods and set of criteria").

criteria. For example, hybrids have been found between the American *Homarus americanus* and the native *Homarus gammarus*, although it is not known whether these hybrids can produce fertile offspring. *Homarus americanus* is assigned to the second highest subcategory within the specific criteria (as *Homarus gammarus* is not classified as a threatened species). 59 species are specified as being able to transmit genetic material to native species, of which 17 are specified as being able to hybridise and potentially **transfer genetic material** to keystone species or native species that are threatened. As an example, *Branta canadensis* (SE) is known to hybridise with a number of other species of geese and ducks, including *Anser fabalis* which is assigned to red list category VU in Norway.

Among the alien species 26 species are specified as being able to **transmit parasites and/ or disease organisms** to native organisms. *Oncorhynchus mykiss* is an example of an alien species which is assessed to cause a severe impact (SE), and which can transmit the parasite *Gyrodactylus salaris* to the native species *Salmo salar*. *Cotoneaster bullatus* (SE) is another example. This garden bush can transmit the serious plant disease fire blight (caused by the bacteria *Erwinia amylovora*) to native species in Norwegian nature. As explained in the chapter "The work of the expert groups", organisms which are themselves parasites are not assessed under this criterion, and bacteria are not considered.

Of the species whose risk has been assessed, 156 may potentially cause **a change in condition to habitat types** in Norway. 51 of these can have an effect on threatened or rare habitat types. Almost all of these are

vascular plants as well as a few algae. *Pinus mugo* (SE) is assessed to the highest subcategory for these criteria because it spreads in *coastal heaths* (red list category EN in the Norwegian red list for ecosystems and habitat types 2011; Lindgaard & Henriksen 2011) and in *sand-dune systems* (VU). The threatened habitat type which is most often specified under this criterion is *lime-rich low-herb open shallow-soil open system in the boreonemoral zone* (VU). A total of 20 alien species could lead to ecological change in *ox-bow lakes*, *meanders* and *flood channels* which are all threatened habitat types (EN).

Habitat types which are neither threatened nor rare in Norway are also expected to experience changes in ecological conditions due to the influence of alien species (105 species).

The effects among species which are assumed to have infinite lifetimes in Norwegian nature: Among alien species recorded in Norway 452 are expected to have a lifespan of more than 1000 years (subcategory 4, criterion A). This means in practice that these species are assumed to be permanently established in the country. A total of 25 of the alien species which will maintain viable populations in Norway in an indefinite future are considered to have an ecological effect at the highest level (subcategory 4). A total of 251 of these species are assessed as exerting no known negative effect (subcategory 1) on Norwegian nature within a 50 year time perspective.

Species groups

Vascular plants make up the largest group of alien species in Norway (Figure 6, Table 7). Previous studies have shown that over half of all Norway's vascular plant flora are alien species (Fremstad et al. 2005). An ecological impact assessment has been made for 821 of the 1719 vascular plants which are defined as alien species. The remaining alien vascular plants are not assessed as they are not capable of reproducing in Norway in course of the next 50 years. Another large group of species which are impact-assessed are beetles, where 69 of 135 alien species have been assessed. Also among fungi a relatively large number of alien species have been recorded (79 species), of which 67 are considered as potentially or genuine capable of reproducing in Norwegian nature, and these are impact-assessed.
Just over 16% of the vascular plants assessed are species with severe (SE) or high (HI) impact, and these are thus included in the Black List (Table 7). A relatively large number of fungi are also found among the two highest impact categories (21 species), where 10 are assessed to category SE, whereas 11 to category HI.

Place of origin

Most of the alien species in Norway which are assessed have their natural distributional range within Europe (53%) (Figure 7). Of the 620 alien species originating

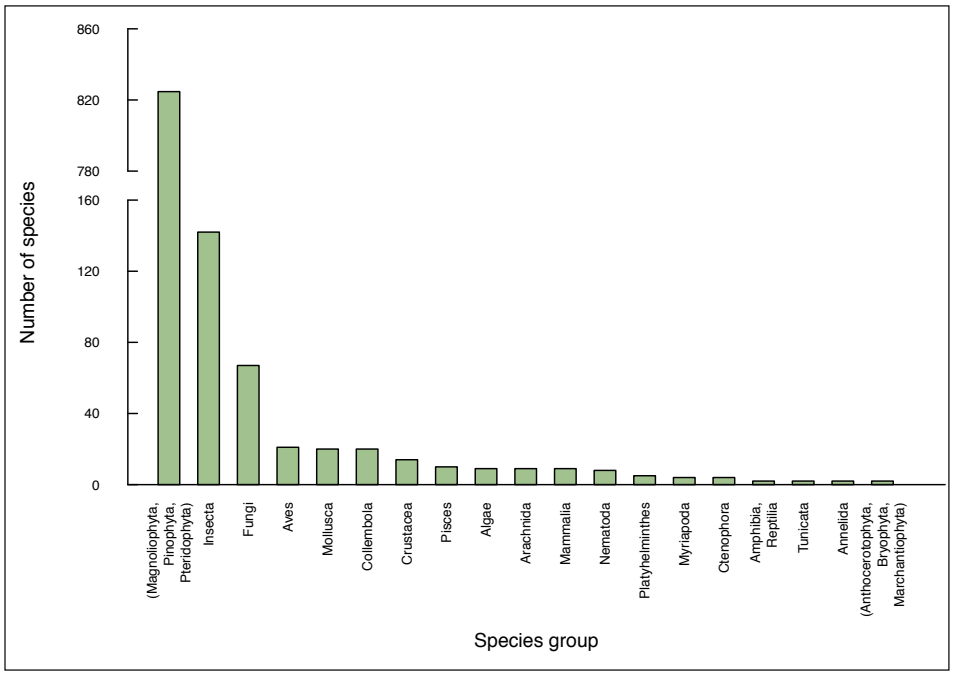

Figure 6. The number of alien species able to reproduce (i.e. all impact-assessed species). Because a large number of vascular plants are assessed, the y-axis is cut at 160 species.

Table 7. Total number of alien species per species group. Information includes number of alien species for each species group, number of impact-assessed species, distribution of species between the various impact categories, number of species on the Black List and proportion (percentage) of alien species on the Black List for Norway, including Svalbard and Norwegian territorial waters

Norway

Scientific name	Total number of alien species	Total number of species assessed	SE	HI	PH	LO	NK	Total number of species on the Black List	Percentage of impact-assessed species which are on the Black List
Algae	9	9	2	2	1	3	1	4	44
Amphibia, Reptilia	2	1	0	1	0	0	0	1	100
Tunicata	2	2	0	1	0	1	0	1	50
Coleoptera	135	69	1	2	18	40	8	3	4
Mollusca	24	20	3	6	0	8	3	9	45
Zygentoma	1	0	0	0	0	0	0	0	
Arachnida	10	9	1	0	1	7	0	1	11
“Pisces”	12	10	2	6	0	2	0	8	80
Platyhelminthes	5	5	1	2	0	2	0	3	60
Aves	59	21	1	1	7	11	1	2	10
Magnoliophyta, Pinophyta, Pteridophyta	1719	821	71	64	155	200	331	135	16
Crustacea	14	14	6	3	0	5	0	9	64
Annelida	2	2	0	1	0	1	0	1	50
Myriapoda	6	4	0	0	0	0	4	0	0
Anthocerotophyta, Bryophyta, Marchantiophyta	2	2	0	1	0	1	0	1	50
Hemiptera	31	27	1	2	3	18	3	3	11
Mammalia	9	9	5	1	0	3	0	6	67
Orthoptera, Dermaptera, Blattodea	14	2	0	0	1	1	0	0	0
Nematoda	8	8	1	4	2	1	0	5	63
Lepidoptera	10	5	0	0	0	5	0	0	0
Fungi	79	67	10	11	0	40	6	21	31
Collembola	20	20	0	0	0	20	0	0	0
Psocoptera, Anoplura, Siphonaptera	6	0	0	0	0	0	0	0	
Cnidaria, Ctenophora	4	4	1	0	0	3	0	1	25
Diptera	30	22	0	1	9	11	1	1	5
Thysanoptera	4	4	0	0	0	2	2	0	0
Hymenoptera	24	13	0	1	1	8	3	1	8
Totalt	**2241**	**1170**	**106**	**110**	**198**	**393**	**363**	**216**	**19**

Svalbard

Scientific name	Total number of alien species	Total number of species assessed	SE	HI	PH	LO	NK	Total number of species on the Black List	Percentage of impact-assessed species which are on the Black List
Magnoliophyta, Pinophyta, Pteridophyta	78	9	0	1	0	5	3	1	11
Mammalia	1	1	0	0	0	1	0	0	0
Sum	**79**	**10**	**0**	**1**	**0**	**6**	**3**	**1**	**10**

Box 23
Picea sitchensis as an example of an alien tree species

There is no good definition to separate between what is a tree and what is a bush. By tree we here refer to taxa which mainly grow from one trunk and reach at least 4-6 metres in height. In this project, a total of 91 of the alien species are defined as trees. This includes conifers in the genus *Abies*, *Larix*, *Picea*, *Pinus**, *Tuja*, *Pseudotsuga*, *Chamaecyparis* and *Tsuga*, and deciduous trees in the genus *Acer*, *Crataegus*, *Laburnum*, *Malus*, *Sorbus*, *Populus* and *Ulmus*. In the genus *Prunus*, *Salix* and *Sambucus* are representatives of both bushes and trees.

With the exception of *Acer pseudoplatanus*, trees were not assessed in the Norwegian Black List 2007. However, some selected conifers were assessed under a separate project. The conclusion was then that the available set of criteria was unsuitable (Øyen et al. 2009). *In Alien species in Norway – with the Norwegian Black List 2012* a total of 91 tree species are assessed, of which 25 species are on the Black List (categories SE and HI), 12 species are considered to have a potentially high impact (PH), 36 species as having a low impact (LO) and 18 species which have no known impact (NK).

One of the species which is considered to have a severe impact (SE) is ***Picea sitchensis***. Due to a large population and good reproductive capabilities, this species is expected to be present in Norwegian nature in the indefinite future.

Picea sitchensis originates from the west coast of North America and is imported to Norway mainly as a production species for forestry purposes, although it is also used for shelter belts. Historically, the species has also been imported for research purposes, but such import has now ceased. *Picea sitchensis* has been established in Norway since the 1950s and is inarguably the most important alien tree species in terms of extent of planting. ***Picea sitchensis*** is mainly planted in coastal areas in heaths, grazed blueberry forest and small fern forest. It is also primarily in these types of habitats it is expected to spread further.

The high impact category is the result of *Picea sitchensis* being able to spread to coastal heaths, which are a threatened habitat type. Coastal heaths are particularly threatened by use coming to an end and consequently by overgrowing. The changes in state in coastal heaths due to *Picea sitchensis* occur instead of changes caused by native species such as *Pinus sylvestris*, *Betula pubescens*, *Salix caprea* and *Sorbus aucupria*. Studies of biodiversity of coastal heaths (O.R. Vetaas pers. comm.) do not reveal negative effects from *Picea sitchensis* at landscape level, but some effects occur on a smaller scale. The future forest structure for *Picea sitchensis* in areas to where it spreads is likely to be small groups in open areas, with a scattering of other species, more or less like in natural forests in North America.

* Except *Pinus mugo* ssp. *mugo*

from Europe, 96 of these (16%) are assessed to the impact categories severe or high impact (i.e. the Black List). A large number of alien species originate from Asia (41% of the species assessed in Norway). 474 of the assessed species have their origins in Asia, and 83 of these are assessed to the two highest impact categories (i.e. the Black List). North America is the region of origin for 214 species (18%), of which 44 are on the Black List. In general, the proportion of black-listed species from various continents is about equal. There are examples of alien species from all corners of the globe which can pose a high or severe ecological impact in Norway. Examples include *Alopochen aegyptiaca* (HI) from Africa, *Opilio canestrinii* (SE) from Europe, *Oncorhynchus gorbuscha* (HI) from Asia, *Ondatra zibethicus* (SE) from North America and *Bonnemaisonia hamifera* (HI) from Oceania. Alien species are often not directly introduced from the species` original range. The species may often have been introduced (and established) in other parts of the world before being introduced by man to Norway. 90 species have arrived in Norway in this way (secondary introduction, see definition in Introduction). Examples include well-known "problem species" such as *Nyctereutes procyonoides* (SE) and *Paralithodes camtschatica* (SE).

Figure 7. Map showing the origins of alien species whose impact in Norway and Norwegian territorial waters have been assessed. Place of origin is shown at continent level, including adjacent oceans. Only the species natural extent of occurrence (range) is shown, and a species may occur as a native across several continents. Coloured shading denotes the total number of alien species that have their natural extent of occurrence within a particular continent – the darker the colour the more species that originate from that particular continent.

First observation in Norway

The total number of observations of alien species in Norway has increased up to present (Figure 8). When we look at different time-periods, it is important to bear in mind that recording frequency for species recording can vary, such that the time a species is first observed in Norway does not necessarily give a correct picture as to when it arrived. An example is that for vascular plants the periods between1920-1940 and 1960-1980 were characterised by relatively low registration activity (R. Elven pers. comm.). In general, good data on occurrences for this species group exists as far back as 1800. In the case of other species groups, there has been historically low recording activity. In the case of insects, for example, we know little about when alien species arrived before 1900 (F. Ødegaard, pers. comm.).

The column which shows arrival date before 1800 comprises 9 species. According to the delimitations for this project species recorded before 1800 are not included. Some of these are however included in Figure 1 because 1) they were imported at an earlier date, but today's reproducing populations originate from imports after 1800, 2) the point of time is uncertain, or 3) they were introduced before 1800, but did not start to reproduce in Norwegian nature until after 1800.

Not all alien species represent a threat to Norwegian nature, even though they have been established here for a long time. Many of the species which have been here for a long time are assessed as having either a low or no known impact, e.g. *Phasianus colchicus* (LO) and *Oryctolagus cuniculus* (LO). Some of the most import-

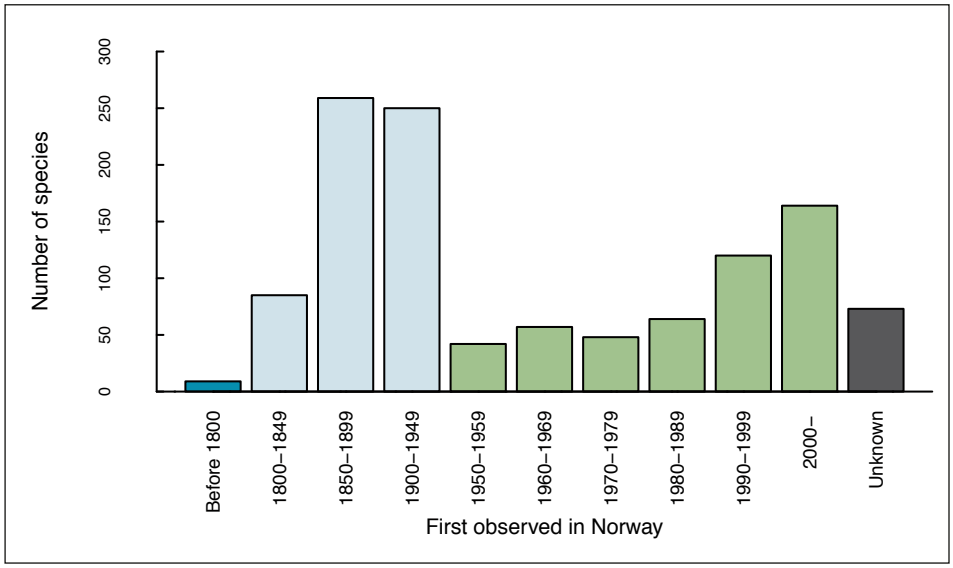

Figure 8. Periods when various alien species which are capable of reproducing in the country were first observed in Norway. Due to historical variations in species recording effort species in the years prior to 1800 are lumped together, species in the period 1800 – 1949 are lumped in 50-year periods, and species from 1950 up until the present are shown in 10-year periods.

ant problem species have also been in the country for a long time. Such examples include *Heracleum persicum* (SE) which was first recorded in Alta in the latter half of the 19th century and *Solidago canadensis* (SE) which was first recorded in Norway around 1820. Between 1850 and 1950, 100 species with Black List status arrived in Norway, whereas in a 30 years period from 1980 to present 56 Black List species were introduced, of which 27 were first observed between 2000 and 2010. An example of a species assumed to be a pest which has arrived in Norway in later years is *Leptoglossus occidentalis* (HI). It was imported to Italy in 1999 from North America, from where it is native. This species has since then spread rapidly northwards in Europe, and is considered as extremely invasive also in England. This species has now been recorded at two sites in Sørlandet (first observed in autumn 2009; Rogaland and Vest-Agder). Another example is the roundworm *Camelostrongylus mentulatus* (HI) (a parasite), first observed in Norway as late as in 2011. This species lives in the abomasum of ruminants and can infect wild deer.

It happens that species, having been "harmless" for a long time at only a few localities around the country, starts to expand explosively and thus pose a great threat to nature (R. Elven pers. comm.). An example of such is *Acer pseudoplatanus* (SE) (see Box 14).

How do alien species arrive?

Half of the alien species which reproduce in Norway are here as the result of escapes or naturalising (591 species) (see also the chapter "Alien species: introduction, establishment and spread"). A large proportion have also arrived in the country as stowaways (400 species), although often the cause of arrival is unknown (Figure 9). Where the reason is specified as unknown it is still assumed that it is due to human activities.

Various activities related to garden centres and plant nurseries are combined the biggest source of deliberate import of alien species into Norway (Figure 10a). Several of the groups shown in Figure 10a represent vectors associated with such activities, such as shelter planting, aesthetic planting, honey production and production of plant decorations. Fremstad et al. (2005) have previously estimated that as much as 40% of vascular plants that we know are expanding in Norway are naturalised garden plants (see also the chapter "Alien species: introduction, establishment and spread"). Yet it is species used in production for various commercial activities which make up the largest single group (45 species), and here most of the alien tree types are included, such as *Picea sitchensis* and *Pinus contorta*. *Crassostrea gogas* is also a production species (SE) which has established in Norwegian nature as a result of naturalisation from farming activities.

Release of species for hunting and trapping has resulted in the presence of 12 alien species, including *Oncorhynchus gorbuscha* (HI) and *Eriocheir sinensis* (SE). Such activities have, however, more or less ceased in Norway, although many alien species may still have established in Norway during introductions before restrictions were implemented. *Helix pomatia* is an alien species which is considered to have a high ecological impact (HI) as the result of illegal release in Norwegian nature. Such releases and

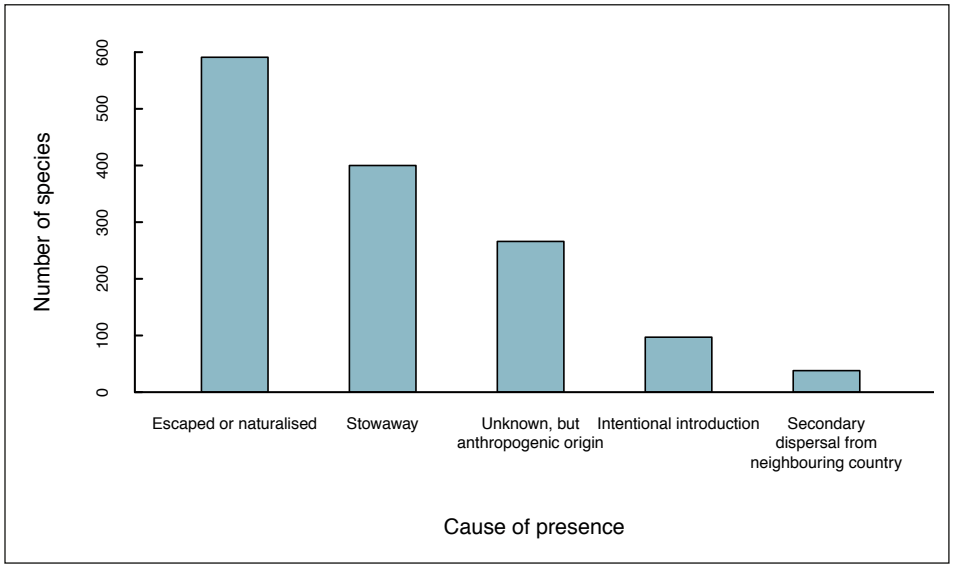

Figure 9. Causes of presence of alien species in Norway.

dumping of species in nature are also probably a cause explaining the presence of a further 12 alien species.

Intentional introductions of species on Black List categories (SE and HI) are most often illegal release / dumping (10 of 13 species), hunting and trapping purposes (9 of 12 species), and related to restoration measures (10 of 15 species).

The majority of alien species have arrived in Norway due to unintentional introductions (Figure 10b). Species which arrive as stowaways with imported plants make up over one third (231 species) of the unintentional introductions of alien species, and 37 of these species are assigned to the Black List categories. Import of various foodstuffs (70 species), timber (46 species), in addition to transport of soil and other types of matter across national boundaries also contribute to the introduction of alien species. Some alien species can themselves function as vectors bringing other species with them into Norway. As an example, at least 6 Heteroptera species are recorded as alien in Norway as a consequence of the distribution of the alien tree species *Populus nigra*. These species are all assessed to the category LO (low impact).

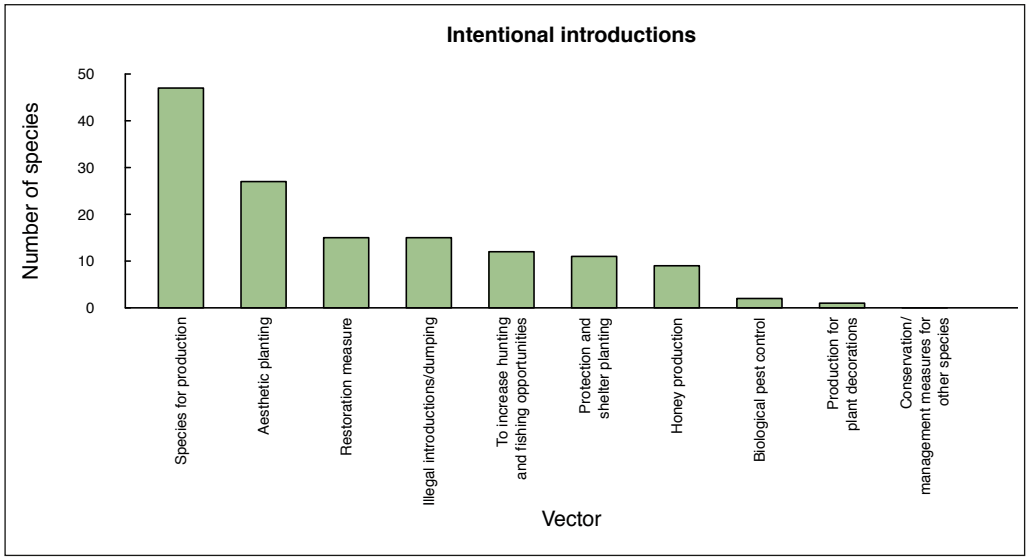

Figure 10a. Number of assessed alien species introduced to Norway intentionally

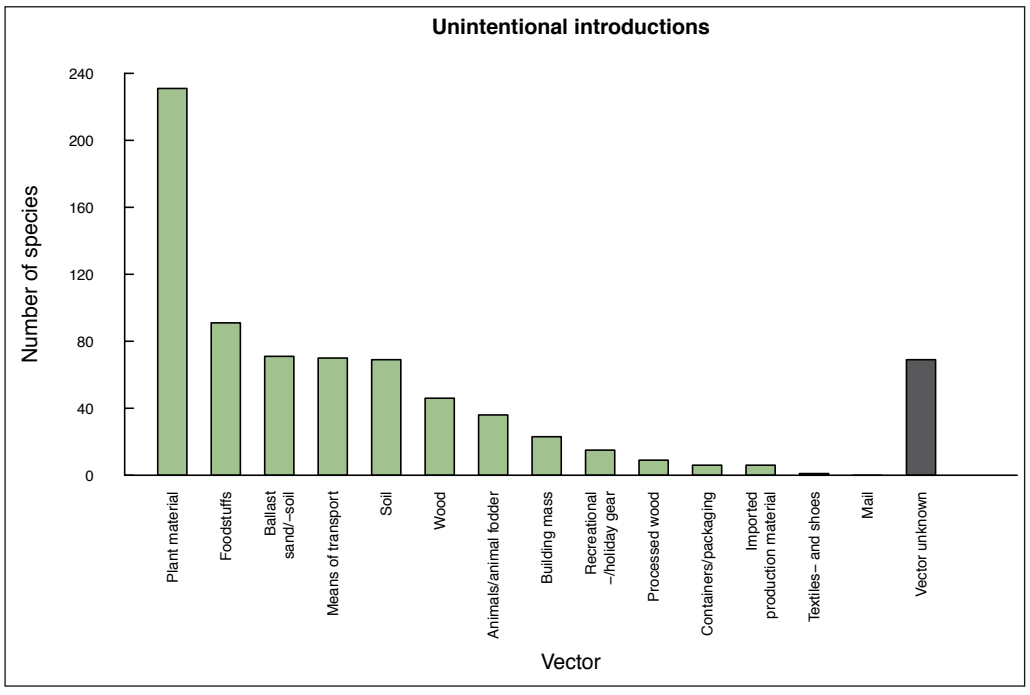

Figure 10b. Number of assessed alien species introduced to Norway unintentionally.

Geographical distribution in Norway

The majority of alien species in Norway are recorded in the south-eastern part of the country. The highest number of alien species are found in the Oslo & Akershus counties (678 species), followed by the counties Vestfold (466 species), Østfold (461 species) and Buskerud (398 species) (Table 8).

The counties with the highest numbers of alien species all border the Oslofjord (Figure 11a). This distribution mirrors to a large degree those counties which in general have high species diversity (Kålås et al. 2010). These areas have a climate offering suitable habitats for a high diversity of species, and these parts of the country also house the highest proportion of threatened native species (cf. Kålås et al. 2010). In addition to generally suitable conditions for species, another reason for the majority of alien species in these areas might be the geographical location of the points of introduction. These are often coastal and associated with main cross-roads regarding intensive traffic to foreign countries. The difference between the number of assessed alien species and the total number of species recorded as alien is greatest for counties in the south-eastern Norway (Table 8). This indicates that a large proportion of alien species which are recorded around the Oslofjord area are species which are not capable of reproducing in Norway.

Species in the two highest impact categories (SE and HI = Black List species) are represented in all Norwegian counties, and the highest total is found in the south-east which also houses the greatest number of alien species as a whole. However, the largest proportion of Black Listed species which are impact-assessed are found in counties further north (Figure 11b). As an example, fewest alien species (66) are recorded in the Finnmark county, yet 40% of the 61 species are assessed to the two highest impact categories (25 species). Corresponding figures are 46% in Nord-Trøndelag county, 44% in Sogn & Fjordane county, and 41% in Nordland county. In Oslo & Akershus counties, where the highest number of alien species is recorded, only 23% are assessed to the highest impact categories.

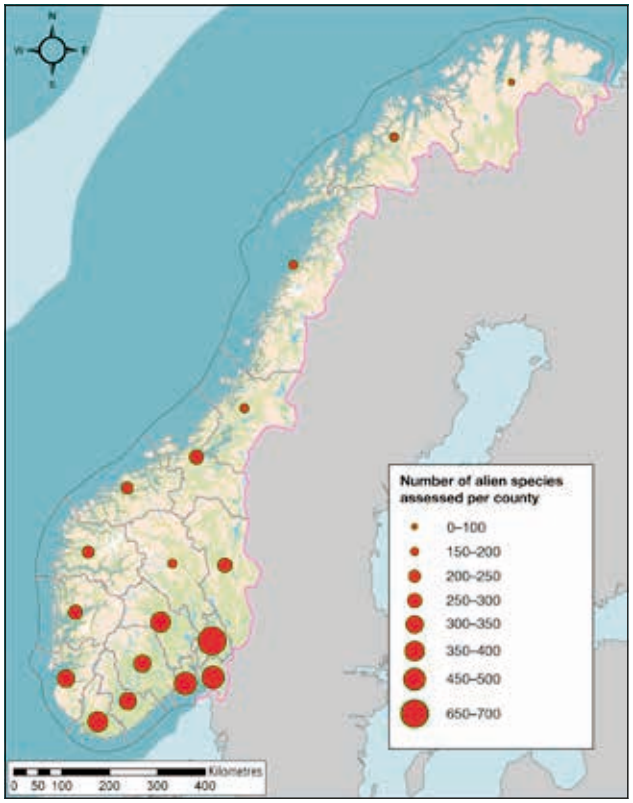

Figure 11a. Total number of alien species for the 19 counties in Norway (Oslo and Akershus are presented as one county).

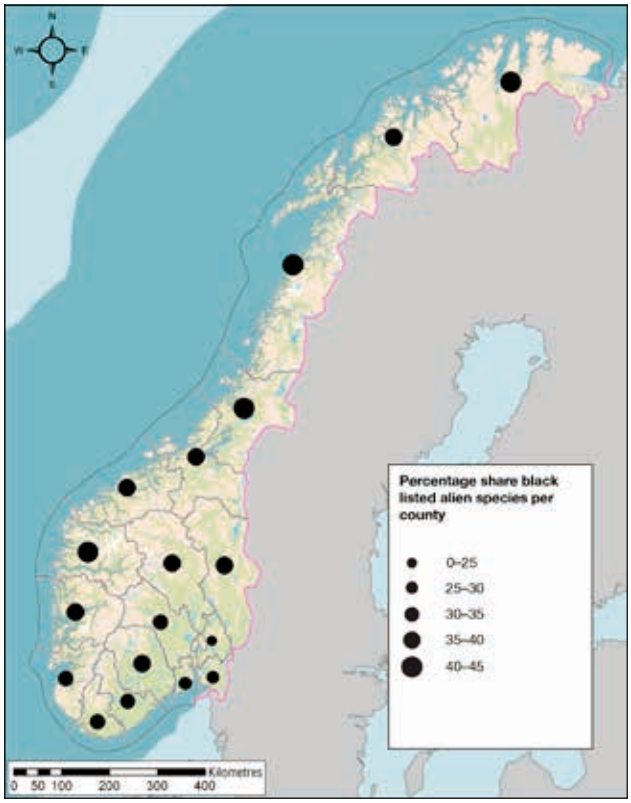

Figure 11b. Percentage of Black Listed species per county. The size of the symbol is proportional with the percentage of all alien species which are Black Listed species within each county.

Table 8. Total number of alien species recorded per county in Norway

County	Total number of alien species	Total number of impact-assessed species	Total number of species on the Black List (categories SE and HI)
Oslo and Akershus	781	678	159
Vestfold	564	466	125
Østfold	550	461	132
Buskerud	472	398	124
Vest-Agder	435	395	124
Rogaland	390	350	114
Aust-Agder	341	326	107
Telemark	333	312	112
Hedmark	316	283	100
Sør-Trøndelag	307	273	99
Hordaland	301	283	101
Møre og Romsdal	213	208	81
Sogn og Fjordane	209	204	89
Oppland	203	186	66
Troms	198	175	65
Nordland	194	186	77
Nord-Trøndelag	184	180	82
Finnmark	66	61	25

Species habitats in Norway

A common phenomenon among alien species is that they establish in frequently disturbed habitats (Fremstad et al. 2005). This pattern is also apparent for the impact assessed alien species in Norway, as a clear majority are found in **constructed sites** (Figure 12) (see Box 23 for an explanation of the terms used to indicate the main habitat for a species). 25 % of the species in this habitat type are assessed to Black List categories.

Examples of habitat types which are described as constructed sites are housing areas, industrial sites, sand pits, roads, golf courses and other sport grounds. A total 599 alien species are registered with constructed sites as their main habitat type in Norway. Many of the species which are capable of establishing and expanding in new habitats are pioneer species and nitrogen-tolerant plant species. These are species which are adapted to be able to establish themselves and spread in poorer habitats that are frequently disturbed. Such areas often allow a lot of sunlight, and are therefore suitable for growth (Fremstad et al. 2005). 431 alien vascular plant species have such areas as their main habitat. In addition, various types of constructed site are more exposed to repeated introduction of alien species due to addition of soil and planting with garden plants. Most of the alien species of Coleoptera (59 species), Fungi (39) and Hemiptera (18) are represented in constructed sites, and all of the Collembola (14) which have been impact-assessed are associated with this habitat type. Edge zones associated with infrastructure (road, rail) are frequently affected by transport activities which can lead to the spread of alien organisms. An example is the transport of stowaways together with imported timber or bark.

Other habitat types which are influenced by humans are also habitats for a large amount alien species. This is the case for **semi-natural sites** (275 alien species) and **arable land and sown grassland** (208 alien species), where 88 and 54 species respectively are assigned to Black List categories. **Woodland** also houses a large proportion of alien species, 321 species are listed as having

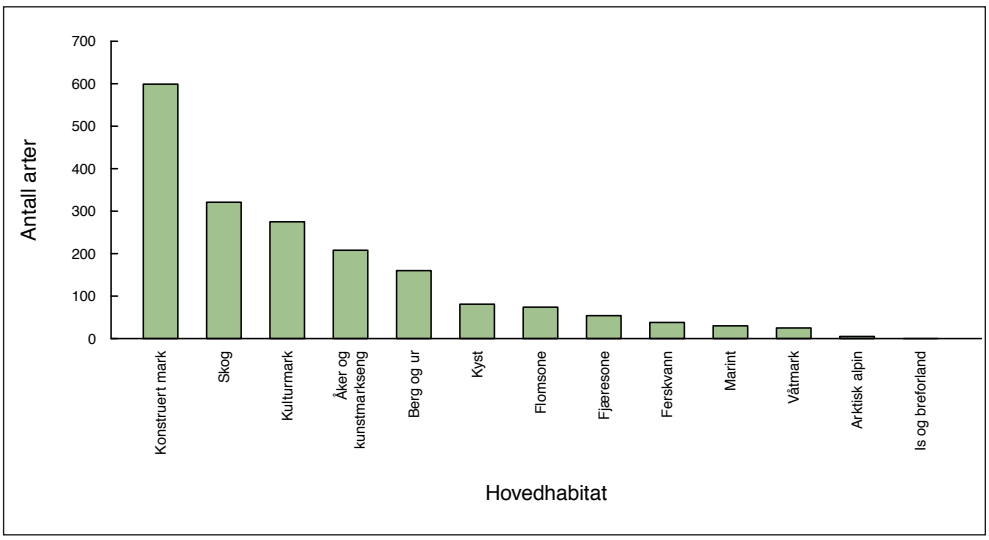

Figure 12. Number of impact-assessed alien species by main habitat in Norway. A species may be recorded in more than one habitat.

woodland as the main habitat, including 108 species on the Black List. Woodland is generally a habitat for many species, both due to the relatively large woodland area in Norway, in addition to the great diversity in niches and microhabitats for various organisms in woodlands. Woodland is the main habitat for a relatively smaller proportion of alien species (34 %) compared to native species in general in Norway (~60% of all native species in Norway, Gundersen & Rolstad 1998).

Marine species are more difficult to discover. Despite the relatively modest number of alien species recorded as having their main habitat in **tidal** and **marine areas**, these habitats can nevertheless house a large number of alien species. Among the impact-assessed alien species, 165 are recorded as having such sites as their main habitat, of which about half are included under Black List categories. A similar proportion, 19 of 38 (50 %) alien species recorded in **freshwater**, are on the Black List.

'Door knockers'

Many alien species which are not yet observed in Norway have non- native populations in neighbouring countries. Some of these species have the potential to spread to Norway ('door knockers') and pose negative effects 'on Norwegian nature. A selection of 203 'door knockers' are therefore included in this project, some of which have been impact-assessed (see the definition of 'door knockers' in the chapter "Introduction" and the chapter "The work of the expert groups" on the process behind selection of species). In addition, a separate list of marine fish which are kept in aquaria in Norway is presented (see Appendix 5). Several of these aquarium fish have the potential to establish themselves in Norwegian territory if they become naturalised.

Coleoptera, Diptera and freshwater fish are the species groups most represented in the 'door knockers' list. This does not necessarily mean that there is a real over-representation of 'door knockers' from these groups, but is rather a result of the way the individual expert groups have chosen how to select 'door knockers'. It may be difficult to predict which species might become a problem in Norwegian nature. 'Door knockers' with a known risk of ecological impact have been given priority in this selection process (see the chapter "The work of the expert groups").

A total of 134 'door knockers' have been subjected to an ecological impact assessment (Table 10). Among these are 25 species included on the Black List, of which 7 are considered as having a severe impact (SE) and 23 as having a high impact (HI). Further, 9 species are considered as having a potentially high impact (PH). 67 'door knockers' are assigned to the category low impact (LO) and 28 species to no known impact (NK). Most 'door knockers' originate from Europe (55 species), followed by North America (39 species) and Asia (26 species). The most common habitat types for 'door knockers' are constructed sites, salt water systems and forests.

Global perspective

The International Union for Conservation of Nature (IUCN) has prepared a list of the 100 worst invasive alien species in the world (see "100 of the world's worst invasive alien species", Lowe et al. 2000). The species on this list are chosen based on two criteria: 1) their influence and effect upon biological diversity and / or human activities, and 2) as illustrative examples of important themes associated with alien species and their establishment and effects in new environments. Unlike the work in preparing *Alien species in Norway – with the Norwegian Black List 2012* no agreeable set of criteria lie behind the global list and nor does any clear methodology in choosing of species. The IUCN list also includes species with an effect upon human interests (economy and health), something which is not included in the Norwegian impact assessments.

Only a rather small proportion (8%) of the species included in *Alien species in Norway – with the Norwegian Black List 2012* are also included on the global list of the worst invasive species, but among these are 8 of 10 species assigned to Black List categories. *Ophiostoma ulmi*, *Eriocheir sinensis*, *Mnemiopsis leidyi*, *Oncorhynchus mykiss* and *Sus scrofa* are assessed as having a severe impact (SE), whereas *Ulex europaeus*, *Linepithema humile* and *Bemisia tabaci* are assessed as having a high impact (HI). Two of the species which are regarded amongst the 100 worst invasive species in the world, are assessed as having a low ecological impact (LO) in Norway; *Oryctolagus cuniculus* and *Euphorbia esula*. As wild *Oryctolagus cuniculus* have only survived at one isolated locality in Norway (Fedje, Hordaland county) the invasive potential and ecological effect are considered to be low / small (impact category LO). *Euphorbia esula* is also assessed as being in the category for low impact (LO) due to its slow expansion in Norway over a period of 150 years and now having reached its potential extent of occurrence in Norway. *Trogoderma granarium* and *Trachemys scripta* are included on the list of the world's worst invasive species and are also recorded as alien species in Norway. Their impact has

not, however, been assessed as they are not considered to be able to reproduce in Norway during the next 50 years.

Among the species included on the IUCN list of worst invasive species 6 species are considered as 'door knockers' in the project on *Alien species in Norway – with the Norwegian Black List 2012*. Of these, four are impact-assessed, and two are considered as having a severe impact (SE). These two species are *Cercopagis pengoi* and *Dreissena polymorpha*. *Anoplophora glabripennis* and *Aedes albopictus* are assessed as having a potentially high impact (PH). The 'door knockers' *Myocastor coypus* and *Undaria pinnatifida* are also included on IUCN's list, but not impact-assessed in our project.

Box 24
Grouping and terminology for main habitats

Marine (salt water systems) – includes ecological systems which are permanently covered by seawater, including brackish water, as well as the floating water mass

Tidal zone (tidal zone systems) – the tidal zone is the area between the lowest normal low-tide level and the highest normal high-tide level or upper limit for regular influence from wave actions or sea spray. This also includes the drift-line. The tidal zone is often referred to as a beach.

Fresh water (fresh water systems) – includes all fresh water habitat types, from large lakes to small ponds as well as all forms of flowing water.

Wetland (wetland systems) – includes all types of mires and spring-water systems. Characterised by a water surface which is near the soil surface, or where there is a rich supply of surface water.

Coast (coastal non-wetland terrestrial system systems) – includes coastal shingle beaches, coastal sand dune systems, bird cliffs and bird cliff meadows

Alluvial zone (Alluvial systems) – includes alluvial forests, open alluvial systems, water-sprayed rocks, and water-sprayed meadows. These includes areas that are regularly under water during flooding, especially along rivers, but also along lakes or areas with long periods of a constantly moist climate due to water spray.

Ice and glacier foreland (ice, snow and glacier foreland) – Glacier forelands are areas which have melted up to glaciers and areas with prolonged snow-cover, although the habitat also includes the ice and snow itself

Rocks (rocks and shallow soil systems) – includes areas without soil cover and areas below the tree limit where the soil is to shallow for forests to grow. This includes bare rock, caves, open avalanche systems, open landslide systems, boulder fields, polar deserts, volcanic fields and open shallow soiled lowland systems.

Woodland (non-wetland terrestrial forest) – includes all forest areas that are not situated in the flood zone along rivers, lakes or within the tidal zone. An area is also a forest even if the trees have been felled and it is expected that the forest will regenerate (e.g. clear-felled areas)

Arctic alpine – includes all areas above or north of the tree limit. This includes, amongst others, alpine heaths and tundra, moss tundra, arctic steppe, as well as all snow-beds, mires and wetlands above the tree limit.

Arable land (arable land and sown grassland) – includes agricultural areas prepared for or subjected to an intensive management regime. These areas are ploughed and treated regularly using heavy machinery.

Semi-natural sites – semi-natural sites consist of grasslands and heaths, sometimes with scattered trees, managed in a "traditional" way such as was practiced up until the Second World War. Semi-natural sites have often been cleared of stones, but are neither ploughed, heavily fertilised nor sprayed. Habitat types included as semi-natural are: semi-natural grasslands, boreal heaths and coastal heaths.

Artificial non-wetland terrestrial system – are areas with a new surface, where humans have removed soil or altered most of the original upper surface. Typical examples include residential areas, industrial sites, sand pits, roads, golf courses and other sport grounds.

Table 9. Alien species assessed in Norway, their impact status and basic species information. The upper part of the table includes species in mainland Norway, whereas alien species in Svalbard are presented separately at the end of the table.

Categories
SE - severe impact, HI - high impact, PH - potentially high impact, LO - low impact, NK - no known impact

Criteria
A - expected lifetime, B_1 - spread velocity, B_2 - increase in occupied area, C - colonisation of habitat type, D - interactions with native threatened or rare species, E - interactions with other species, F - state changes in threatened or rare habitat types, G - state changes in other habitat types, H - genetic introgression, I - host for parasite or pathogen
Assessment to sub-category 1 for the individual criteria is not presented in the table
* See footnote on connections between criteria A and B on page 126

Main habitats
M - marine, F - tidal zone, Ky - Coast, L - freshwater, Fl - flood (alluvial) zone, V - wetland, S - forest, B - rock, A - arctic alpine, K - semi-natural sites, Å - arable land, KO - constructed sites

Occurrence per county
• – newer occurrence, based upon observations after 1980 to the present day
° – older occurrence, where the species has not been recorded after 1980
County is not given for some species. The species is found in Norway, although records are unavailable to county level.

NORWAY AND THE NORWEGIAN TERRITORIAL WATERS

Scientific name	Species group	Category	Criteria*	Main habitat	Østfold	Oslo og Akershus	Hedmark	Oppland	Buskerud	Vestfold	Telemark	Aust Agder	Vest Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark	The Barents Sea	The Arctic Ocean	The Norwegian sea	The North Sea
Severe impact (SE)																										
Acer pseudoplatanus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C2 $B_2/B_3$3 D3 E3 F3 G2	K Ky S Ko Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Achillea nobilis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$3 D3 E2	Ko Å B		•					•		•													
Allium schoenoprasum schoenoprasum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$3 D3 E2 H3	K Ky Ko B	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•					
Amelanchier alnifolia	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$2 $B_2/B_3$4 D3 E2 F3 G2	Ky S Fl B		•			•																	
Amelanchier lamarckii	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$2 $B_2/B_3$4 D3 E2 F3 G2	K S Ko Fl B		•			•				•	•	•											
Amelanchier spicata	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$3 C2 $B_2/B_3$3 D3 E3 F3 G2	K S Ko Fl B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Anguillicoloides crassus	Nematoda	SE	A4 $B_1$3 C3 D4 E2		•				•			•		•												
Arabis caucasica	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$3 D3 E2 H3	Ky S Ko B		•	•		•	•	•		•	•	•	•		•	•	•	•					
Arctium tomentosum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$3 E2 G2 H3	K Ko Å	•	•	•	•	•	•	•		•	•				•	•		•					
Arion vulgaris	Mollusca	SE	A4 E4 G2 H3	S V Ko Å Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Barbarea vulgaris	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 D3 E3 F3 G2	Ky Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Berberis thunbergii	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 E2 F3 G2	K Ky S V Ko Å Fl B	•	•	•	•	•	•	•	•	•	•	•	•	•	•								
Branta canadensis	Aves	SE	A4 $B_1$2 C2 E2 H4 I2	F L V	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Calystegia sepium spectabilis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 H3	S Ko Fl B	•	•	•		•	•			•	•	•				•							
Campanula latifolia macrantha	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 H3	K S Ko	•		•						•				•	•		•	•					
Caprella mutica	Crustacea	SE	A3 $B_1$4 D3 E2	M							•	•	•	•	•	•	•	•	•	•	•					
Cerastium tomentosum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C2 $B_2/B_3$4 D3 E3 F3 G2 H3	K Ky Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•				
Chionoecetes opilio	Crustacea	SE	A3 $B_1$2 C4 D4 E3 G3 I2	M																		•				
Clematis alpina	Magnoliophyta, Pinophyta, Pteridophyta	SE	A3 $B_2/B_3$4 H4	K S Ko B		•	•	•	•																	
Corydalis solida	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 H3	S Ko	•	•				•	•	•	•	•	•		•	•		•	•					
Cotoneaster bullatus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 D3 E3 F3 G2 I4	K Ky S Ko B	•	•			•	•	•	•	•	•	•	•	•	•								
Cotoneaster dielsianus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 D3 E2 F3 G2	K Ky S Ko B	•	•	•		•	•	•	•	•	•	•	•										
Cotoneaster divaricatus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 D3 E3 F3 G2	K Ky S Ko B	•	•			•	•	•	•	•	•	•	•	•	•	•							

Scientific name	Species group	Category	Criteria*	Main habitat	Østfold	Oslo og Akershus	Hedmark	Oppland	Buskerud	Vestfold	Telemark	Aust Agder	Vest Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark	The Barents Sea	The Arctic Ocean	The Norwegian sea	The North Sea
Cotoneaster horizontalis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E2 F3 G2	K Ky S Ko B		•			•	•	•	•	•	•	•	•		•	•							
Cotoneaster lucidus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E3 F3 G2	Ky S F Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Cotoneaster multiflorus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E2 F3 G2	Ky S B		•			•				•														
Cotoneaster salicifolius	Magnoliophyta, Pinophyta, Pteridophyta	SE	A3 B_2/$B_3$2 I4	K S Ko									•	•	•												
Crassostrea gigas	Mollusca	SE	A3 $B_1$4 C2 D3 E4 G2	M	•	•				•	•	•			•												
Deraeocoris lutescens	Hemiptera	SE	A4 $B_1$3 C2 E3 G2	K Ko Å	•	•			•	•																	
Elodea canadensis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$2 C3 B_2/$B_3$4 D4 E3 F4 G2	L	•	•		•	•	•	•	•		•	•				•								
Elodea nuttallii	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C2 B_2/$B_3$4 D4 E3 F4 G2	L										•	•												
Ensis directus	Mollusca	SE	A3 $B_1$3 C3 D4 E3	M	•	•						•	•														
Epilobium ciliatum ciliatum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$3 C4 B_2/$B_3$4 D3 E3	K S F L V Ko Å Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Epilobium ciliatum glandulosum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C3 B_2/$B_3$4 E3	K S F L V Ko Å Fl		•	•		•	•		•	•	•	•	•	•	•	•	•	•						
Eriocheir sinensis	Crustacea	SE	A4 $B_1$4 D3 E2 F3 G2		•				•																		
Erysiphe alphitoides	Fungi	SE	A4 $B_1$4 C2 D3 E3 G2	S	•	•	•		•	•	•	•	•	•	•												
Festuca rubra commutata	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 H3	Ko	•	•	•		•	•	•	•		•				•									
Geum macrophyllum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 E2 H3	K S Ko Fl	•	•							•	•	•	•	•	•		•							
Gyrodactylus salaris	Platyhelminthes	SE	A4 C2 D4						•	•						•	•		•	•	•						
Harmonia axyridis	Coleoptera	SE	A3 $B_1$4 D3 E2	K V Ko Å		•				•		•	•			•	•	•									
Heracleum mantegazzianum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 E3 F3 G2 H3	K S Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Heracleum persicum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$3 C2 B_2/$B_3$4 E3 F3 G3 H3	K S F Ko Å	•	•	•	•						•	•	•	•	•	•	•	•	•					
Heterosiphonia japonica	Algae	SE	A4 $B_1$4 C3 D4 E3 F4 G2	M		•				•	•	•	•	•	•	•	•	•									
Homarus americanus	Crustacea	SE	A3 $B_1$3 D4 E4 H3 I4	M		•				•		•	•				•										
Hymenoscyphus pseudoalbidus	Fungi	SE	A4 $B_1$3 C4 D4 E4 F4 G4	K S	•	•	•	•	•	•	•	•	•	•	•	•											
Impatiens glandulifera	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E3 F3 G2	K S F V Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Impatiens parviflora	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 D3 E3	S F Ko Å Fl	•	•			•	•	•		•	•	•	•											
Laburnum alpinum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E3 F3 G2	S Ko B	•	•	•		•		•		•	•	•	•	•	•	•	•							
Laburnum anagyroides	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 D3 E2 F3 G2	S Ko B	•	•			•		•	•	•	•	•												
Lamiastrum galeobdolon galeobdolon	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 E2 H4	S Ko	•	•	•		•	•		•	•	•	•	•	•	•	•								
Larix decidua	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 F3 G2	K S Ko	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Lepidium latifolium	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$2 C2 B_2/$B_3$4 D3 E3 F4 G2	F Ko	•	•	•		•	•	•	•															
Lepus europaeus	Mammalia	SE	A4 $B_1$2 C4 E3 H3	K Å	•																						
Linaria repens	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$2 B_2/$B_3$3 H3	K Ko Å Fl	•	•	•			•		•	•	•	•	•	•	•									
Lonicera caerulea	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E2 F3 G2	K S Ko	•	•	•	•	•	•	•		•					•	•	•	•						
Lotus corniculatus sativus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 H3	Ko Å	•	•	•	•		•	•	•		•	•	•	•	•	•	•	•	•					
Lupinus nootkatensis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$3 B_2/$B_3$4 E3 F3 G2	K Ky Ko	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•					
Lupinus perennis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$3 B_2/$B_3$4 E3 F3 G2	K Ky Ko Fl		•				•	•	•	•	•	•		•	•		•	•	•					
Lupinus polyphyllus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C3 B_2/$B_3$4 D4 E3 F4 G2	S Ko Å Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Malus ×domestica	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 H4	Ky S Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					

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Melampsoridium hiratsukanum	Fungi	SE	A4 $B_1$4 C4 E3 G3	S	•	•	•	•	•	•	•	•			•		•	•	•	•						
Melilotus albus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C2 B_2/$B_3$3 D3 E2	Ky Ko Å B	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•						
Mnemiopsis leidyi	Porifera, Cnidaria, Ctenophora	SE	A3 $B_1$4 D3 E3 F3 G4	M	•	•			•	•	•	•		•	•											
Mycosphaerella pini	Fungi	SE	A4 $B_1$4 C2 D3 E2 F3 G2	S			•		•	•	•										•					
Myrrhis odorata	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 E3 F3 G2	K S Ko Å		•	•	•	•	•	•	•	•	•	•	•	•	•			•					
Neovison vison	Mammalia	SE	A4 $B_1$3 C4 D4 E4 G4	K Ky F L V Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Nyctereutes procyonoides	Mammalia	SE	A4 $B_1$3 C3 D4 E3 I2	K S V Å															•	•	•	•				
Odontites vernus serotinus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$2 H4	F Ko Å	•	•	•		•	•	•		•					•								
Oncorhynchus mykiss	"Pisces"	SE	A3 $B_1$3 E3 I4	L	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•				
Ondatra zibethicus	Mammalia	SE	A4 $B_1$3 C4 E3 G3 I2	L V															•	•	•	•				
Ophiostoma novo-ulmi	Fungi	SE	A4 $B_1$3 C2 D4 E3 G2	K S		•			•	•	•		•		•											
Ophiostoma ulmi	Fungi	SE	A3 $B_1$2 D4 E3	K S		•																				
Opilio canestrinii	Arachnida	SE	A4 $B_1$3 D3 E3	S V Ko	•	•				•	•															
Pacifastacus leniusculus	Crustacea	SE	A4 $B_1$2 D4 E3 I4	L	•	•					•							•								
Paralithodes camtschatica	Crustacea	SE	A3 $B_1$3 C4 D4 E3 G4 I2	M																		•				
Pastinaca sativa hortensis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E3	K Ko Å B	•	•	•		•	•	•	•	•	•												
Phedimus hybridus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 D3 E2 G2	Ky Ko B	•	•	•		•		•	•	•		•	•		•		•						
Phedimus spurius	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C2 B_2/$B_3$3 D3 E3 F3 G2	K Ky Ko B	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•						
Phytophthora plurivora	Fungi	SE	A4 $B_1$3 C2 D3 E2 G2	Ko B		•				•				•	•											
Phytophthora ramorum	Fungi	SE	A4 $B_1$3 C2 E4 G2	K S B		•							•	•	•		•									
Picea sitchensis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 E2 F3 G2	K Ky S	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•					
Pinus mugo mugo	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 F3 G2	K Ky S A	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Pinus strobus	Magnoliophyta, Pinophyta, Pteridophyta	SE	A3 B_2/$B_3$2 I4	S		•							•													
Populus ×berolinensis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 E3 F3 G2	S Ko Fl	•	•	•		•	•			•					•								
Populus balsamifera	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 E3	S Ko Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Reynoutria ×bohemica	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 E3 G2	S Ko Å	•	•	•		•	•				•	•		•	•	•	•	•					
Reynoutria japonica	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C2 B_2/$B_3$4 E3 G3	S F Ko Å Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Reynoutria sachalinensis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E3 G2	S F Ko Å Fl	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Ribes rubrum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$3 H3	K Ky S Ko Å Fl B																						
Rosa rugosa	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C2 B_2/$B_3$4 D4 E3 F4 G3 H3	K Ky S F Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Salix ×fragilis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$3 C2 B_2/$B_3$3 E3 G2 H3	S F Ko Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
Salix euxina	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$2 B_2/$B_3$4 E2 H3	S F Ko Fl	•	•			•	•	•	•	•	•												
Sargassum muticum	Algae	SE	A4 $B_1$3 C2 D4 E3 F3 G3	M	•	•			•	•	•	•	•	•	•		•									
Solidago canadensis	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 C3 B_2/$B_3$3 D3 E3 F3 G2	K S Ko Å B	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•						
Sorbus intermedia	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D3 E2 H4	K Ky S Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Sorbus mougeotii	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 B_2/$B_3$4 D4 E2 H4	K Ky S Ko B		•	•		•	•	•		•	•	•	•	•	•								
Suillus grevillei	Fungi	SE	A4 $B_1$3 D3 E3	K S													•									
Sus scrofa	Mammalia	SE	A4 $B_1$3 C4 D3 E3 G2 I2	K S Å	•	•	•																			

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Swida sericea	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$4 D3 E3 F3 G2	S Ko Fl	•	•	•	•	•	•	•	•	•		•	•		•	•		•					
Thymus praecox praecox	Magnoliophyta, Pinophyta, Pteridophyta	SE	A3 $B_2/B_3$3 H4	K Ko B	•				•	•	•					•										
Tinca tinca	"Pisces"	SE	A4 D3 E3 H4	L	•	•	•		•		•	•	•	•												
Tricholoma psammopus	Fungi	SE	A4 $B_1$3 D3 E3	K S													•									
Tsuga heterophylla	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$3 E3	K S V Ko		•		•	•	•	•	•	•	•	•	•	•	•		•						
Vinca minor	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$3 D3 E2 F3 G2	S Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•								
Vincetoxicum rossicum	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_1$2 $B_2/B_3$3 D3 E2 F3 G2	Ky S F Ko B		•			•																	
Viola odorata	Magnoliophyta, Pinophyta, Pteridophyta	SE	A4 $B_2/B_3$3 H4	K S Ko	•	•	•		•	•	•	•	•	•	•			•								
High impact (HI)																										
Abies alba	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2 G2	S	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Acartia tonsa	Crustacea	HI	A3 $B_1$3 C2 E3	M								•														
Agaricus subperonatus	Fungi	HI	A4 D3 E2	K Ky Ko	•	•		•					•	•				•								
Alchemilla mollis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2 G2	K Ko B	•	•		•		•			•	•	•	•		•	•	•	•					
Alopochen aegyptiaca	Aves	HI	A3 H3	L																						
Amphibalanus improvisus	Crustacea	HI	A3 $B_1$2 C3 E3 G2	M	○	○			○	○	○	○	○	○												
Anthyllis vulneraria carpatica	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 $B_2/B_3$3 H3	Ko Å	•	•	•	•	•	•	•	•		•			•	•	•							
Arion rufus	Mollusca	HI	A2 E2 H3	K Ko														•								
Aronia ×prunifolia	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 $B_2/B_3$4 E2	Ky S F Ko Fl B	•	•				•			•	•	•	•	•									
Aruncus dioicus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 C3 $B_2/B_3$4 E2 G2	K S Ko Fl B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Bemisia tabaci	Hemiptera	HI	A3 I4	Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Bergenia cordifolia	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	S Ko B	•	•		•		•	•	•			•		•		•	•	•					
Bonnemaisonia hamifera	Algae	HI	A4 C3 D3 E3 F3 G2	M	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•					
Bromopsis inermis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 C2 $B_2/B_3$2 E3 G2	K F Ko Å Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Bunias orientalis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_1$2 C2 $B_2/B_3$2 D3 E3 F3 G2	K Ko Å B	•	•	•	•	•	•	•	•	•	•					•							
Camelostrongylus mentulatus	Nematoda	HI	A4 $B_1$4 E2 I2				•																			
Campanula glomerata Superba	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$3 E2	K S Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Campylopus introflexus	Anthocerotophyta, Bryophyta, Marchantiophyta	HI	A4 $B_1$2 D3 E2	K Ky S	•							•	•	•	•	•	•									
Caragana arborescens	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 G2	K S Ko B	•	•	•	•	•	•	•	•	•		•	•		•		•		•				
Carassius auratus	"Pisces"	HI	A3 I4									•		•												
Celastrus orbicularis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A2 $B_2/B_3$2 D3 E2 F3 G2	S		•																				
Centaurea montana	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	K S Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Centaurea nigra nemoralis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A2 H3	Ko	•																					
Cicerbita macrophylla	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	K S Ko Å	•	•			•			•		•	•		•	•	•	•	•					
Cicerbita plumieri	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	K S Ko									•	•	•		•									
Codium fragile	Algae	HI	A4 D3 E2 G2	M	•	•				•	•	•	•	•	•	•	•	•		•	•					
Cotoneaster moupinensis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2 G2	S Ko		•			•	•			•	•												
Cotoneaster tomentosus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	Ky S B	•	•			•																	
Crataegus laevigata	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$2 H3 I2	K Ky S Ko B	•	•	•	•	•	•	•	•	•	•	•	•		•	•							

Scientific name	Species group	Category	Criteria*	Main habitat	Østfold	Oslo og Akershus	Hedmark	Oppland	Buskerud	Vestfold	Telemark	Aust Agder	Vest Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark	The Barents Sea	The Arctic Ocean	The Norwegian sea	The North Sea
Crataegus sanguinea	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2 G2	K S Ko Fl	•	•	•											•	•							
Crepidula fornicata	Mollusca	HI	A3 $B_1$3 D3 E2	M		•				•		•		•												
Crepis biennis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	K S Ko Å	•	•	•	•	•	•	•			•												
Cronartium ribicola	Fungi	HI	A4 $B_1$3 E2	K S	•	•	•	•	•	•	•	•	•	•	•	•	•	•								
Culex pipiens	Diptera	HI	A4 $B_1$3 I2	L V		•						•														
Dama dama	Mammalia	HI	A4 E3	S	•																					
Daphnia ambigua	Crustacea	HI	A4 D3	L								•														
Doronicum macrophyllum	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 $B_2/B_3$3 E3	K S Ko														•			•	•				
Echinops sphaerocephalus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$2 D3 E2 F3 G2	K Ky F Ko B	•	•	•		•	•																
Erysiphe hypophylla	Fungi	HI	A4 $B_1$4 E2	K S	°	°					°		°													
Festuca ovina capillata	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 $B_2/B_3$3 H3	Ko		•			•	•	•				•	•			•	•						
Festuca rubra megastachys	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 $B_2/B_3$3 H3	Ko Å	•	•	•		•		•		•	•		•										
Filipendula kamtschatica	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2 G2	K S Ko Fl										•	•	•			•	•	•					
Fragaria moschata	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2 G2	K S Ko Å	•	•	•	•	•	•	•	•				•		•	•							
Geum aleppicum	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 $B_2/B_3$2 H3	Ko		•					•				•											
Geum quellyon	Magnoliophyta, Pinophyta, Pteridophyta	HI	A2 $B_2/B_3$3 H3	Ko		•				•	•						•		•		•					
Glomerella acutata	Fungi	HI	A4 $B_1$3 E2	K B	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•						
Glyceria grandis	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	Ko Å Fl	•	•	•	•	•			•	•			•		•		•						
Glyceria maxima	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 C2 $B_2/B_3$2 D3 E3 F3 G2	S F Fl	•	•	•		•	•	•	•	•	•	•				•							
Gobio gobio	"Pisces"	HI	A3 $B_1$2 D3 E2			•			•	•			•													
Helix pomatia	Mollusca	HI	A4 D3 E3	Ko B	•	•			•	•	•	•				•		•			•					
Ips amitinus	Coleoptera	HI	C2 G4 I4	S																						
Lepomis gibbosus	"Pisces"	HI	A2 E2 I4		•	•			•																	
Leptoglossus occidentalis	Hemiptera	HI	A3 $B_1$3 C2 E3 G2	K Ko Å									•	•												
Leucaspius delineatus	"Pisces"	HI	A4 $B_1$2 E3	L								•														
Limax maximus	Mollusca	HI	A4 E3	Ko	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Linepithema humile	Hymenoptera	HI	$B_1$2 E3 G2	Ko																						
Lithocharis nigriceps	Coleoptera	HI	A4 $B_1$3 C2 E2	K Ko Å		•	•																			
Lonicera caprifolium	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	S Ko	•	•			•	•	•		•			•			•							
Lonicera involucrata	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2 G2	S Ko	•	•	•		•	•	•	•		•	•				•	•	•					
Lonicera tatarica	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	K S Ko B	•	•	•	•	•	•	•	•				•		•	•	•	•					
Lycium barbarum	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$3 E2	Ky S F Ko B	•	•			•	•		•														
Lysimachia nummularia	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$2 D3 E3	K S Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
Lysimachia punctata	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	K S Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Mahonia aquifolium	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_2/B_3$4 E2	S Ko Fl B	•	•	•		•	•	•	•					•									
Marenzelleria viridis	Annelida	HI	A3 $B_1$3 C3 D3 E3 G2	M					•																	
Melilotus altissimus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 C2 $B_2/B_3$2 D3 E2	F Ko Å	•	•			•	•	•															
Meloidogyne hapla	Nematoda	HI	A4 $B_1$2 C3 D3 E2	Å																						
Meloidogyne naasi	Nematoda	HI	A4 $B_1$2 C2 D3 E3	Å																						
Mutinus ravenelii	Fungi	HI	A4 $B_1$2 D3 H3	S Ko	•	•	•	•	•	•	•	•						•	•							
Nematodirus battus	Nematoda	HI	A4 $B_1$4 C4 E2 I2		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Nymphoides peltata	Magnoliophyta, Pinophyta, Pteridophyta	HI	A2 $B_2/B_3$2 D3 E3 F3 G2		•																					

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Oncorhynchus gorbuscha	"Pisces"	HI	A3 E3	L																		•				
Oxychilus draparnaudi	Mollusca	HI	A4 E3	Ko		•				•	•	•			•	•	•			•						
Petasites hybridus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2	K Ko Å	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•					
Petasites japonicus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2 G2	S Ko Å	•	•	•				•		•	•	•	•	•	•	•	•						
Phaeolepiota aurea	Fungi	HI	A4 $B_1$3 C2 E2	S Ko	•	•	•	•	•	•	•				•		•	•	•	•	•					
Phytophthora cambivora	Fungi	HI	A4 $B_1$3 E2	S Ko						•				•												
Phytophthora gonapodyides	Fungi	HI	A4 $B_1$2 D3	S		•								•	•											
Phytophthora megasperma	Fungi	HI	A4 $B_1$3 C2 E2	S										•	•											
Phytophthora syringae	Fungi	HI	A4 $B_1$3 C2 E2	K Ko B										•												
Picea glauca	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$3 E2 G2	K S	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Pinus peuce	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 I4	S Ko		•				•					•											
Potamopyrgus antipodarum	Mollusca	HI	A3 $B_1$2 E3 I3	M F L	•	•			•		•	•	•	•				•								
Prunus cerasifera	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2	S Ko	•	•			•	•	•	•	•	•												
Prunus cerasus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$3 E2	S Ko B	•	•	•	•	•	•	•	•	•			•		•	•	•						
Prunus serotina	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 B_2/$B_3$4 E2 G2	Ko	•	•			•				•	•												
Pseudodactylogyrus anguillae	Platyhelminthes	HI	A4 C2 D3		•	•																				
Pseudodactylogyrus bini	Platyhelminthes	HI	A4 D3		•																					
Rana kl. *esculenta*	Amphibia, Reptilia	HI	$B_1$2 D3 E2	L V																						
Robinia pseudacacia	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 B_2/$B_3$3 E2 F3 G2	Ko	•	•			•	•	•	•	•													
Rubus armeniacus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2	S Ko		•				•	•	•	•	•	•		•									
Rumex pseudoalpinus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 B_2/$B_3$4 E2																		•					
Salix ×meyeriana	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$3 E2	S F Ko Fl	•	•	•		•	•		•	•	•	•	•	•			•						
Salvelinus namaycush	"Pisces"	HI	A3 E3	L															•							
Sambucus racemosa	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 C3 B_2/$B_3$2 E2 G3	S F Ko Fl B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Senecio inaequidens	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2	K Ky Ko	•	•	•		•	•			•	•	•											
Senecio viscosus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 $B_1$2 B_2/$B_3$3 E2 G2	K Ky F Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Solidago gigantea	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2	K S Ko Fl	•	•			•	•		•	•		•	•										
Sorbaria sorbifolia	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2 G2	K S Ko Fl	•	•	•	•	•		•	•	•	•	•	•		•	•	•	•	•				
Spiraea ×rosalba	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2 G2	K S Ko Å Fl B	•	•	•	•	•	•	•	•	•	•	•	•		•			•					
Spiraea ×rubella	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2 G2	Ky S Ko Å Fl B	•	•	•		•	•	•	•	•	•	•	•	•									
Stratiotes aloides	Magnoliophyta, Pinophyta, Pteridophyta	HI	A2 D3 E2 F3 G2		•																					
Styela clava	Branchiopoda, Echinodermata, Tunicata	HI	A3 $B_1$3 D3 E3 G2	M								•		•	•											
Swida alba	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2	S Ko Fl	•	•	•	•	•	•	•	•	•	•	•				•		•					
Symphytum ×uplandicum	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$4 E2	K Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Symphytum officinale	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$2 D3 E3	Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Syringa vulgaris	Magnoliophyta, Pinophyta, Pteridophyta	HI	A4 B_2/$B_3$3 E2 G2	K Ky S Ko B	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•					
Taphrina ulmi	Fungi	HI	A4 D3	S									•	•		•										

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Ulex europaeus	Magnoliophyta, Pinophyta, Pteridophyta	HI	A3 $B_2/B_3$2 E2 F3 G2	K Ky Ko					•																	
Viola ×wittrockiana	Magnoliophyta, Pinophyta, Pteridophyta	HI	A2 $B_2/B_3$3 H3	Ko	•	•	•		•				•			•	•	•		•	•	•				
Potentially high impact (PH)																										
Abies concolor	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S		•	•	•	•																	
Abies grandis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S		•			•				•	•	•	•										
Abies sibirica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S	•	•	•	•										•	•	•	•	•				
Acer ginnala	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko	•	•	•		•	•			•													
Acheta domestica	Orthoptera, Blattodea, Dermaptera	PH	A3 $B_1$4	Ko	•	•					•															
Aconitum ×stoerkianum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K Ko	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Aconitum napellus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko		•			•	•	•		•		•	•	•			•	•					
Aconogonon ×fennicum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K Ky Ko					•			•	•	•						•		•				
Aconogonon divaricatum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko						•							•			•	•					
Acrotrichis cognata	Coleoptera	PH	A4 $B_1$3 C3	K S Ko																						
Acrotrichis insularis	Coleoptera	PH	A4 $B_1$4 C4	K Ko																						
Aesculus hippocastanum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
Aethusa cynapium	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko Å B	•	•	•		•	•	•	•	•	•	•	•		•								
Allium ×hollandicum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko	•	•	•																			
Allium victorialis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ky S F Ko Fl		•								•						•						
Anaphalis margaritacea	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko B	•	•			•	•	•	•	•	•	•	•	•		•	•						
Anemone sylvestris	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko B	•	•	•				•							•								
Anser caerulescens	Aves	PH	H4	M L																						
Anser canagicus	Aves	PH	H4	L V A																						
Anser indicus	Aves	PH	H4	M L																						
Anser rossii	Aves	PH	H4	L																						
Arabidopsis arenosa	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K Ko Å Fl B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Arabidopsis suecica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$3 $B_2/B_3$3	Ko Å		•	•	•	•	•							•	•	•	•						
Armoracia rusticana	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K F Ko Å Fl	•	•	•	•	•	•	•	•	•	•	•	•		•	•							
Astrantia major	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K S Ko	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•					
Atomaria lewisi	Coleoptera	PH	A4 $B_1$3 C3	S Ko		•	•	•		•					•		•									
Atractotomus parvulus	Hemiptera	PH	A4 $B_1$3	K Ko Å	•								•													
Aurinia saxatilis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ky Ko B	•	•				•		•	•	•												
Baeocrara japonica	Coleoptera	PH	A4 $B_1$3 C2	K Ko Å					•									•								
Bergenia crassifolia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S Ko B	•		•		•		•	•	•			•					•					
Betonica macrantha	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko Å B	•	•	•		•	•	•	•	•	•			•	•		•	•					
Bistorta officinalis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K S Ko Å Fl	•	•	•		•	•			•		•	•			•	•		•				
Branta hutchinsii	Aves	PH	H4	A																						
Campanula rapunculoides	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K S Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Carpinus betulus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko	•	•			•	•		•	•	•	•											
Cartodere nodifer	Coleoptera	PH	A4 $B_1$3 C2	K Ko Å		•	•		•	•	•	•	•			•			•							

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Chaenorhinum minus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$3 B_2/$B_3$3	Ky Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Chenopodium polyspermum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	Ky Ko Å Fl	•	•	•	•	•	•	•	•	•		•					•						
Claytonia sibirica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	S Ko		•					•	•		•	•		•									
Clematis vitalba	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	S Ko B		•									•											
Conyza canadensis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$3 C2 B_2/$B_3$3	Ko Å	•	•	•	•	•	•	•	•	•	•		•	•	•	•		•	•				
Coronopus didymus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	Ko	•	•			•	•	•	•	•	•												
Cotoneaster ascendens	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	Ky S B		•							•	•												
Cotoneaster dammeri	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	K S Ko B		•			•	•	•			•												
Cotoneaster foveolatus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	S B		•			•					•	•											
Cotoneaster laetevirens	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	Ky S		•							•	•												
Cotoneaster simonsii	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	Ky S Ko B						•	•	•	•	•	•	•										
Cotoneaster villosulus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	Ky S Ko B	•	•			•	•			•	•												
Crocus vernus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	K S Ko	•	•				•		•	•		•		•	•		•	•					
Cryptophagus acutangulus	Coleoptera	PH	A4 $B_1$3 C3	K Ko Å																						
Cryptopleurum subtile	Coleoptera	PH	A4 $B_1$3 C2	K Ko Å		•								•				•								
Cymbalaria muralis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	Ko B	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•					
Dalotia coriaria	Coleoptera	PH	A4 $B_1$3 C2	K Ko Å		•	•	•	•	•	•							•								
Dicentra formosa	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	S Ko Fl B	•	•	•		•			•	•	•	•	•	•	•			•					
Doronicum columnae	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	S Ko	•	•			•	•	•	•	•	•	•		•	•		•	•	•				
Draba nemorosa	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$2 B_2/$B_3$4	K Ko Å B		•	•	•	•	•	•															
Drosophila hydei	Diptera	PH	A3 $B_1$4	Ko Å	•	•								•					•	•	•					
Drosophila immigrans	Diptera	PH	A3 $B_1$4	Ko										•												
Drosophila melanogaster	Diptera	PH	A4 $B_1$4	K Ko		•																				
Echinochloa crus-galli	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	Ko Å	•	•	•		•	•	•		•	•		•		•	•							
Elaeagnus commutata	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	Ky Ko	•	•	•		•				•					•		•						
Epilobium hirsutum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	V Ko Å Fl	•	•	•			•	•	•	•	•												
Eryngium giganteum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	K Ko		•			•																	
Euonymus europaeus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	S Ko	•	•		•	•		•	•	•		•											
Euphorbia cyparissias	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	K Ky S Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•				
Galanthus nivalis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	K S Ko	•	•			•	•	•	•	•	•	•	•	•	•		•	•					
Galinsoga parviflora	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	Ko	•	•	•		•	•		•	•								•					
Galinsoga quadriradiata	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	Ko	•	•	•		•	•	•	•	•	•												
Gasterophilus intestinalis	Diptera	PH	A4 $B_1$4	K																						
Geranium pyrenaicum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	K Ko Å B	•	•	•		•	•	•	•	•	•		•										
Geranium sibiricum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	Ko		•								•												
Globodera pallida	Nematoda	PH	A4 $B_1$2 C4	Å		•				•		•	•	•					•							
Globodera rostochiensis	Nematoda	PH	A4 $B_1$2 C4	Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
Haematobosca stimulans	Diptera	PH	A4 $B_1$3	K																						

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Helianthus ×laetiflorus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko	•					•		•	•													
Herniaria glabra	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	Ky Ko B	•	•	•	•	•	•	•	•	•	•												
Heterogaster urticae	Hemiptera	PH	A4 $B_1$3 C2	K S Ko																						
Hyacinthoides hispanica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko	•							•	•	•	•											
Hyacinthoides non-scripta	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko B						•		•	•	•	•	•	•									
Hylotelephium telephium	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	B	•		•		•					•	•	•	•	•	•		•					
Hypoderma lineatum	Diptera	PH	A4 $B_1$4	K																						
Iris sibirica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko Fl	•	•	•		•	•		•	•	•	•	•		•	•							
Juncus tenuis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$2 $B_2/B_3$4	K S V Ko Å Fl B	•	•	•		•	•	•	•	•	•	•											
Laburnum ×watereri	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ko	•	•			•		•	•	•		•		•	•								
Lactuca serriola	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$2 $B_2/B_3$4	Ky F Ko Å B	•	•	•		•	•	•		•					•								
Lathyrus latifolius	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S Ko B	•	•				•			•													
Lepidium campestre	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K Ky Ko Å B	•	•			•	•	•	•	•	•	•			•								
Lepidium densiflorum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$3	K Ko Å B	•	•	•	•	•	•	•		•	•		•										
Lepidium ruderale	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 C2 $B_2/B_3$3	Ko Å	•	•	•	•	•	•	•		•	•		•		•								
Ligularia dentata	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko										•						•	•					
Ligularia stenocephala	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko					•												•					
Ligustrum ovalifolium	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ky S Ko B		•				•	•		•	•		•										
Lilioceris lilii	Coleoptera	PH	A4 $B_1$3	K Ko	•	•			•	•	•	•					•	•								
Lilium bulbiferum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	K S Ko B	•	•	•		•			•	•	•		•	•			•	•					
Lilium martagon	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko Å Fl		•	•	•	•	•	•	•	•		•		•	•	•	•	•					
Linum perenne	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	K Ko B		•		•	•	•	•	•														
Lophodytes cucullatus	Aves	PH	H4	L																						
Lunaria annua	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ky S Ko B	•	•	•		•	•	•	•	•	•	•			•								
Lyctocoris campestris	Hemiptera	PH	A4 $B_1$3	K Ko Å		•		•				•		•	•			•		•						
Meconopsis cambrica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ky Ko Å		•				•			•	•	•	•	•			•	•					
Megaselia gregaria	Diptera	PH	A4 $B_1$3	Ko																						
Megastigmus spermotrophus	Hymenoptera	PH	A3 $B_1$4	S																						
Melampyrum nemorosum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko Å	•	•			•	•			•													
Melophagus ovinus	Diptera	PH	A4 $B_1$4	K																						
Mentha ×piperita	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	K Ko	•	•			•	•		•	•	•	•	•										
Mentha ×rotundifolia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko	•				•	•	•			•	•			•								
Mentha longifolia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K Ko Fl								•	•	•		•		•	•	•						
Mimulus guttatus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K Ko Å Fl						•			•	•	•					•	•	•				
Monochamus alternatus	Coleoptera	PH	D3 E2 I4	S																						
Muscari armeniacum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S Ko	•							•	•													
Muscari botryoides	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	Ky S Ko B	•	•	•	•	•	•	•	•	•	•						•	•					

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Myosotis sylvatica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•				
Narcissus poëticus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K S Ko Å	•	•	•		•	•	•	•	•		•	•	•	•		•	•					
Narcissus pseudonarcissus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko Å B	•	•			•		•	•	•	•		•	•			•	•					
Neosiphonia harveyi	Algae	PH	A4 $B_1$3	M F						•			•		•		•									
Noccaea caerulescens	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 C3 $B_2/B_3$3	K Ky S Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Oenothera muricata	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	F Ko Fl	•	•			•	•		•	•													
Oestrus ovis	Diptera	PH	A4 $B_1$4	K																						
Omalium rugatum	Coleoptera	PH	A4 $B_1$3 C4	K S Ko Å		•	•	•		•		•							•							
Omonadus floralis	Coleoptera	PH	A4 $B_1$3 C2	Ko		•		•										•								
Omphalodes verna	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko	•	•			•			•	•		•			•								
Ostearius melanopygius	Arachnida	PH	A4 $B_1$3	K Å	•	•			•				•													
Othocallis siberica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K S Ko Å B	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•					
Oxalis stricta	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	Ko Å	•	•	•		•	•	•	•	•	•	•			•								
Oxyura jamaicensis	Aves	PH	H4	L	•	•		•		•			•	•	•		•	•	•	•	•					
Papaver croceum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ko Å A	•		•	•	•	•	•	•	•		•	•	•	•		•	•	•				
Perigona nigriceps	Coleoptera	PH	A4 $B_1$3 C2	K Å				•	•				•					•								
Persicaria wallichii	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko									•	•	•											
Phedimus aizoon	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K Ko B	•	•		•	•		•				•				•							
Philonthus rectangulus	Coleoptera	PH	A4 $B_1$3 C3	Ko																						
Phlox subulata	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko B	•	•			•	•	•		•													
Picris hieracioides	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko		•			•									•								
Pinus cembra	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S		•		•				•			•		•	•		•	•					
Pinus contorta	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Porotachys bisulcatus	Coleoptera	PH	A4 $B_1$3	S	•	•	•	•	•	•	•	•	•						•							
Potentilla intermedia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	Ko Å B	•	•	•	•	•	•	•	•	•		•											
Potentilla thuringiaca	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$3 $B_2/B_3$3	K Ko B	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•						
Primula elatior	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K Ko	•	•		•	•								•	•	•	•	•	•	•			
Pseudofumaria lutea	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ko B	•	•	•		•	•	•	•	•	•	•			•								
Ptinella johnsoni	Coleoptera	PH	A4 $B_1$3 C2	S		•			•																	
Pulmonaria mollis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	Ky S Ko	•	•				•		•	•		•					•						
Pulmonaria rubra	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko		•				•		•	•		•	•		•		•	•					
Puschkinia scilloides	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko	•	•			•			•	•							•	•					
Pyrus ×communis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ky S Ko B	•	•			•		•	•	•			•										
Reesa vespulae	Coleoptera	PH	A4 $B_1$4	Ko																						
Rheum ×rhabarbarum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	K Ko	•	•	•	•	•		•	•	•	•			•	•	•	•	•	•				
Ribes ×pallidum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S Ko Å		•	•			•		•	•				•	•								
Ribes sanguineum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S Ko B	•					•			•	•		•	•									
Rorippa ×armoracioides	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K Ko Å	•	•	•		•	•	•	•	•	•	•											

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Rorippa austriaca	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	Ko	•	•	•		•	•	•		•	•	•			•								
Rosa glauca	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K Ky S Ko Fl B	•	•	•		•	•		•	•	•		•		•	•	•						
Rubus laciniatus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko	•	•			•	•	•	•	•	•			•									
Rubus odoratus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko	•	•			•	•	•	•	•					•	•	•						
Rubus parviflorus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko		•											•	•								
Rumex rugosus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko		•				•																
Salix ×dasyclados	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S Ko Fl	•	•			•	•			•	•					•	•						
Salix ×smithiana	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	K Ky Ko	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Salix viminalis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko Å Fl	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•						
Sanguisorba minor balearica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	K Ko B	•	•			•	•	•								•							
Saponaria officinalis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	K Ko Å	•	•	•		•	•	•	•	•	•	•			•	•							
Saxifraga ×geum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko B		•							•	•	•	•	•	•		•	•					
Saxifraga rotundifolia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S Ko B																•	•					
Saxifraga umbrosa	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko B		•				•	•	•	•	•	•	•	•	•	•	•	•					
Scilla forbesii	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko	•	•	•			•	•	•						•	•	•	•					
Scilla luciliae	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko	•	•	•		•		•	•	•					•		•	•					
Scilla sardensis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko		•			•		•	•	•													
Scopolia carniolica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko Å Fl	•	•	•	•		•			•													
Sedum forsterianum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ko B					•				•	•		•	•	•	•		•					
Sedum hispanicum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko B		•				•	•					•										
Sedum sexangulare	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ko B		•	•	•		•	•	•	•	•												
Senecio cordatus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$3 $B_2/B_3$4	K S Ko																	•	•				
Senecio pseudoarnica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ky F Ko																	•					
Senecio squalidus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	F Ko B	•	•					•		•		•											
Solanum physalifolium	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	Ko Å	•				•	•																
Sorbus austriaca	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_2/B_3$4	S		•			•				•	•												
Sorbus latifolia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko	•	•			•			•			•		•									
Spergularia rubra	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$2 $B_2/B_3$3	K Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•				
Spiraea ×billardii	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	Ko Å Fl	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•					
Spiraea ×macrothyrsa	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko Fl		•			•	•			•		•											
Spiraea chamaedryfolia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko B	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•				
Spiraea japonica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko B	•	•	•		•	•	•	•	•		•	•										
Spiraea latifolia	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$4	S Ko Fl	•	•			•	•		•	•	•	•											
Symphoricarpos albus	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_2/B_3$3	S Ko	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					

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Symphyotrichum ×salignum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	S Ko Å Fl	•	•	•	•	•	•	•		•	•	•	•										
Symphyotrichum ×versicolor	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	K S Ko Fl	•	•	•			•			•		•	•	•	•	•	•	•					
Symphyotrichum novi-belgii	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	S Ko Å Fl	•	•	•			•	•	•	•		•	•	•	•								
Symphytum asperum	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Syringa josikaea	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	S Ko	•	•		•				•	•	•				•		•	•	•				
Telekia speciosa	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	K S Ko Å Fl	•	•			•	•		•	•	•	•	•	•				•					
Tellima grandiflora	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	S Ko Å										•	•					•	•					
Trichiusa immigrata	Coleoptera	PH	A4 $B_1$4	K Ko Å														•								
Tulipa sylvestris	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	K Ky F Ko B	•	•			•	•	•	•	•	•	•	•				•						
Veronica filiformis	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$4	Ko		•			•	•	•	•	•	•	•	•	•	•								
Veronica gentianoides	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 B_2/$B_3$4	K S V Ko				•		•	•		•					•			•	•				
Veronica peregrina peregrina	Magnoliophyta, Pinophyta, Pteridophyta	PH	A3 $B_1$2 B_2/$B_3$4	Ko		•	•			•				•												
Veronica persica	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 $B_1$2 B_2/$B_3$3	Ko Å	•	•	•	•	•	•	•	•	•	•	•	•		•	•		•					
Viburnum lantana	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	K S Ko	•	•			•	•	•	•	•	•	•			•	•							
Waldsteinia ternata	Magnoliophyta, Pinophyta, Pteridophyta	PH	A4 B_2/$B_3$3	K S Ko		•	•								•						•					
Low impact (LO)																										
Abies balsamea	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	S								•	•	•	•	•	•	•	•	•						
Abies koreana	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2											•												
Abies lasiocarpa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	K S	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
Abies procera	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	S	•	•				•	•	•	•	•	•	•	•	•	•	•						
Acer campestre	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	S Ko	•	•				•	•	•	•	•	•											
Acer negundo	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 E2 G2	S Ko		•																				
Acer tataricum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	K S Ko	•	•	•		•																	
Aconogonon alpinum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2	Ko			•							•	•	•					•					
Aconogonon weyrichii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	K Ko											•		•									
Acrotona parens	Coleoptera	LO	A4 $B_1$2 C2 E2	K Ko Å		•																				
Acrotona pseudotenera	Coleoptera	LO	A4 $B_1$2 C2	K Ko Å							•															
Acrotrichis henrici	Coleoptera	LO	A3 $B_1$2 C2	F Ko						•																
Adistemia watsoni	Coleoptera	LO	A2 $B_1$2	Ko																						
Agaricus bisporus	Fungi	LO	A4 E2	S Ko	•		•			•		•			•			•	•	•						
Agaricus bitorquis	Fungi	LO	A4 E2	S Ko	•	•				•								•								
Agaricus moelleri	Fungi	LO	A2	Ko					•																	
Agaricus xanthodermus	Fungi	LO	A4 E2	S Ko		•					•															
Aglaothamnion halliae	Algae	LO	A4 $B_1$2	M	•	•				•	•															
Ahasverus advena	Coleoptera	LO	A4 $B_1$2	K Ko Å																						
Aix galericulata	Aves	LO	H3	L	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•				
Aix sponsa	Aves	LO	H3	L	•		•	•	•	•	•		•	•					•							
Albatrellus syringae	Fungi	LO	A4 $B_1$2 C2 E2	S Ko		•	•	•	•	•								•	•	•	•	•				
Alchemilla heptagona	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Å																		•				
Alchemilla semilunaris	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Å																		•				

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Alnus viridis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2	Ko										•												
Alphitobius diaperinus	Coleoptera	LO	A2 $B_1$2	Ko																						
Alphitophagus bifasciatus	Coleoptera	LO	A3	K Ko Å		•	•				•	•														
Alyssum alyssoides	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4	K Ky Ko Å B	•	•	•	•																		
Ameiurus nebulosus	"Pisces"	LO	A3	L		◦																				
Amsinckia micrantha	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$2	Ko Å	•	•		•		•																
Anas cyanoptera	Aves	LO	H3	L														•								
Anas erythrorhyncha	Aves	LO	H3	L									•													
Anas formosa	Aves	LO	H3	L										•												
Anas sibilatrix	Aves	LO	H3	L									•					•								
Andronicus dentiger	Crustacea	LO	A4	Ko		•					•	•					•									
Anemonidium canadense	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2 E2	K S Ko	•	•														•						
Anthrenus verbasci	Coleoptera	LO	A3 $B_1$2	K Ko Å											•											
Aphrastasia pectinatae	Hemiptera	LO	A3	K	•	•	•	•	•	•	•			•		•	•	•	•	•	•					
Argiope bruennichi	Arachnida	LO	A3 $B_1$2	F	•					•																
Argyresthia fundella	Lepodoptera	LO	A4	S Ko		•						•	•													
Argyresthia trifasciata	Lepodoptera	LO	A4	Ko									•	•	•		•	•								
Aristolochia clematitis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S Ko		•				•																
Armadillidium nasatum	Crustacea	LO	A3	Ko					•																	
Artemisia stelleriana	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$2	F Ko					•																	
Asparagus officinalis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	K Ky F Ko Å B	•	•	•		•	•	•	•	•			•			•							
Astilbe ×arendsii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko	•	•						•	•		•	•										
Attagenus smirnovi	Coleoptera	LO	A2	Ko		•									•			•								
Beckmannia syzigachne	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	K S V Ko Å Fl			•	•				•		•		•	•		•							
Berberis aggregata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	K S Ko		•							•	•												
Berteroa incana	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 C2 B_2/$B_3$2	Ky Ko Å B	•	•	•	•	•	•	•	•	•			•		•								
Betonica officinalis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko B		•									•	•										
Bisnius parcus	Coleoptera	LO	A4 $B_1$2	K Ko		•		•			•							•								
Bithynia tentaculata	Mollusca	LO	A3	L	•						•															
Boettgerilla pallens	Mollusca	LO	A3 E2	K S Ko																						
Bohemiellina flavipennis	Coleoptera	LO	A3 C2	Ko														•								
Braula coeca	Diptera	LO	A4 $B_1$2	K Å																						
Brunnera macrophylla	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	S Ko		•				•		•	•	•												
Bryonia alba	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	Ky F Ko Å B	•	•	•		•	•	•	•	•	•	•	•	•	•								
Buddleja davidii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 E2 G2	Ko									•													
Buteo swainsonii	Aves	LO	H3	S																						
Buxus sempervirens	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$2	K Ko							•	•	•			•	•									
Caenoscelis subdeplanata	Coleoptera	LO	A4 $B_1$2 C2	K S Ko Å																						
Cairina moschata	Aves	LO	H3	L V		•			•				•					•								
Campanula patula	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	K Ko Å	•	•	•	•	•	•	•							•								
Carcinops pumilio	Coleoptera	LO	A4 $B_1$2 C2	Ko Å	•	•		•									•	•								
Carpophilus hemipterus	Coleoptera	LO	A2	K Å		•				•	•		•				•									
Carpophilus marginellus	Coleoptera	LO	A4 $B_1$2	Ko Å		•	•			•	•															
Cartodere bifasciata	Coleoptera	LO	A3 $B_1$2 C2	K Ko		•																				
Cartodere constricta	Coleoptera	LO	A4 $B_1$2	K S Ko																						

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Ceratophysella gibbosa	Collembola	LO	A2																							
Cercidiphyllum japonicum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$2	Ko Å		•												•								
Chaenomeles japonica	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$3	Ky S Ko	•	•	•		•				•	•	•											
Chamaecyparis lawsoniana	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S Ko		•			•			•	•					•								
Chamaecyparis nootkatensis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko B					•						•		•									
Chenopodium murale	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3			•			•		•			•		•										
Clematis tangutica	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$4	Ko		•	•	•		•																
Clematis viticella	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S		•																				
Coleosporium tussilaginis	Fungi	LO	A4 $B_1$2 C3 E2	S	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Colpomenia peregrina	Algae	LO	A4	M	•	•				•	•	•	•	•	•	•	•	•	•							
Contarinia pisi	Diptera	LO	A4	Å	•	•	•	•	•	•	•	•	•													
Contarinia pyrivora	Diptera	LO	A4	Å																						
Coproporus immigrans	Coleoptera	LO	A3 $B_1$2	Ko		•	•																			
Cordylophora caspia	Porifera, Cnidaria, Ctenophora	LO	A3 E2	M	•																					
Corticaria elongata	Coleoptera	LO	A4 $B_1$2 C2	Ko																						
Corydalis bracteata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko		•																				
Cotoneaster nanshan	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$2								•				•											
Crataegus macracantha	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S B		•										•										
Crocus tommasinianus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S Ko		•								•	•		•									
Cryptophagus cellaris	Coleoptera	LO	A2	Ko		•							•	•												
Cryptophagus subfumatus	Coleoptera	LO	A2	Ko		•			•					•				•								
Cryptopygus thermophilus	Collembola	LO	A2																							
Cygnus atratus	Aves	LO	H3	L	•	•			•	•		•	•	•	•	•										
Dacnusa sibirica	Hymenoptera	LO	A3	K Å																						
Dasineura mali	Diptera	LO	A3	K							•				•											
Dasineura pyri	Diptera	LO	A4 $B_1$2	S																						
Dasiphora fruticosa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Dasya baillouviana	Algae	LO	A4	M						◦																
Daucus carota carota	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ky Ko Å B	•	•			•	•	•	•	•	•			•	•								
Delphinella abietis	Fungi	LO	A4 $B_1$2	K S	•		•	•		•			•	•	•	•	•	•	•	•						
Dermestes haemorrhoidalis	Coleoptera	LO	A3 $B_1$2	Ko		•									•											
Deroceras panormitanum	Mollusca	LO	A3	K																						
Desoria trispinata	Collembola	LO	A2		•	•																				
Diadumene lineata	Porifera, Cnidaria, Ctenophora	LO	A3 E2	M										•												
Dianthus barbatus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K S Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•		•			•					
Dianthus plumarius	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	Ky S Ko B	•	•		•	•							•	•									
Didymascella thujina	Fungi	LO	A4	K Ko		•						•		•	•											
Diplotaxis muralis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ky Ko B	•	•			•	•	•	•	•													
Dracocephalum sibiricum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko				•														•				
Drosophila busckii	Diptera	LO	A2 $B_1$4	Ko Å	•	•										•					•					
Echinops bannaticus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko		•								•												
Echinops exaltatus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	K Ko		•				•		•	•							•						
Echinothrips americanus	Thysanoptera	LO	A3	Ko Å						•																

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Echium vulgare	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ky Ko B	•	•	•	•	•	•	•	•	•	•	•			•	•							
Epilobium tetragonum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko Å	•	•	•			•	•															
Epinotia fraternana	Lepodoptera	LO	A4	S Ko	•	•							•	•	•											
Epinotia nigricana	Lepodoptera	LO	A4	S Ko		•							•													
Epinotia subsequana	Lepodoptera	LO	A4	S Ko		•						•	•													
Epitrix pubescens	Coleoptera	LO	A4 $B_1$2 C2 E2	K Ko Å	•																					
Eranthis hyemalis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S Ko		•							•	•												
Erigeron annuus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$4	Ko		•				•			•													
Eryngium planum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K Ko B	•	•				•					•					•						
Erysiphe divaricata	Fungi	LO	A4 $B_1$2 E2	S V B		•		•	•	•			•	•	•	•			•							
Erysiphe flexuosa	Fungi	LO	A4	S Ko		•																				
Erysiphe friesii	Fungi	LO	A4 $B_1$2	S B		•						•														
Erysiphe palczewskii	Fungi	LO	A4 $B_1$2 E2	B		•		•																		
Erysiphe syringae-japonicae	Fungi	LO	A4	B		•			•		•															
Erysiphe vanbruntiana	Fungi	LO	A4 $B_1$2	Ko B	•	•	•	•	•		•	•		•	•	•			•							
Erysiphe viburnicola	Fungi	LO	A4 $B_1$2 E2	S B		•				•			•	•		•										
Euonymus nanus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S		•			•																	
Euophryum confine	Coleoptera	LO	A3 $B_1$2	Ko											•											
Euphorbia esula	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ko Å	•	•	•	•	•	•	•	•	•			•			•							
Euphorbia peplus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	Ko	•	•	•		•	•	•	•	•	•												
Falco cherrug	Aves	LO	H3																							
Folsomia penicula	Collembola	LO	A2			•																				
Folsomia similis	Collembola	LO	A2			•																				
Fragaria virginiana	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	S Ko	•	•			•																	
Frankliniella occidentalis	Thysanoptera	LO	E2	K Ko	•	•			•	•	•	•	•	•	•	•	•	•	•							
Friesea sublimis	Collembola	LO	A2			•																				
Gabronthus thermarum	Coleoptera	LO	A2	K Ko Å		•																				
Gagea minima	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	S Ko		•																				
Gagea pratensis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	Ko		•																				
Galium mollugo mollugo	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2	Ko		•																				
Geranium nodosum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko		•																				
Geranium palustre	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$3	Ko					•	•																
Geranium phaeum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K S Ko	•	•				•	•															
Gomphidius maculatus	Fungi	LO	A4 E2	S													•									
Goniadella gracilis	Annelida	LO	$B_1$3	M																					•	•
Gonionemus vertens	Porifera, Cnidaria, Ctenophora	LO	A3 $B_1$3 C2	M										•												
Gryllotalpa gryllotalpa	Orthoptera, Blattodea, Dermaptera	LO	A2	K V Å		•																				
Guignardia aesculi	Fungi	LO	A4	K S Ko	•	•				•					•											
Gypsophila muralis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$3	Ko		•	•			•	•		•	•												
Gyromitra sphaerospora	Fungi	LO	A4	Ko		•	•		•																	
Halerpestes cymbalaria	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_1$2 C2 $B_2/B_3$2	F	•					•		•	•													
Harpalus signaticornis	Coleoptera	LO	A3 $B_1$2	K F Ko																						
Helianthus rigidus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	K Ko	•				•	•																

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Hemerocallis lilioasphodelus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	Ko	•	•	•		•	•		•	•		•		•	•		•						
Henoticus californicus	Coleoptera	LO	A3	Ko																						
Hesperis matronalis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 C2 B_2/$B_3$2 E2	K S Ko Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Heterothops stiglundbergi	Coleoptera	LO	A3 $B_1$2	K Ko Å		•																				
Holodiscus discolor	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$2	S Ko		•						•	•													
Hoplocampa minuta	Hymenoptera	LO	A4 E2	Ko Å																						
Hordeum jubatum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 C2	Ko B	•	•	•	•	•	•	•		•			•			•		•					
Hottonia palustris	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 E2 G2		•																					
Hydrotaea aenescens	Diptera	LO	A4 $B_1$2	K S Ko										•	•											
Hylotelephium anacampseros	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2 E2	Ko B			•				•	•				•										
Hylotelephium ewersii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2 E2	Ko B	•	•			•	•	•	•	•		•	•		•			•					
Hypogastrura serrata	Collembola	LO	A2	Ko Å												•										
Hypoponera punctatissima	Hymenoptera	LO	A4 $B_1$2 C2	Ko		•			•	•																
Illinoia lambersi	Hemiptera	LO	A2	K						•																
Inula helenium	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K Ko	•	•				•	•			•												
Ischyrocerus commensalis	Crustacea	LO	A3 $B_1$3 E2																			•				
Janetiella siskiyou	Diptera	LO	A2	Ko																						
Juncus ensifolius	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	Ko						•									•							
Kybos abstrusus	Hemiptera	LO	A3 $B_1$3	K Ko Å	•	•			•	•	•															
Lachnellula calyciformis	Fungi	LO	A4	K S	•	•				•	•		•	•	•	•	•	•	•	•	•					
Lachnellula occidentalis	Fungi	LO	A4	K S	•	•	•	•		•	•	•		•	•		•	•		•						
Lachnellula willkommii	Fungi	LO	A4	K S	•	•	•			•	•		•	•	•	•	•	•	•	•						
Larix ×marschlinsii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	S								•	•	•	•	•										
Larix kaempferi	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S						•	•	•	•	•	•	•	•	•	•	•						
Larix sibirica	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S A	•	•	•	•	•	•				•	•	•	•	•	•	•	•					
Lathyrus tuberosus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	K Ko	•	•			•	•	•							•								
Lathys humilis	Arachnida	LO	A4	K Ko Å		•						•														
Lepidium draba	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4	F Ko Å	•	•				•		•	•	•				•								
Lepidium heterophyllum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_1$2	K Ko Å						•	•	•	•	•												
Lepidocyrtus curvicollis	Collembola	LO	A2	Ko																						
Lepidocyrtus pallidus	Collembola	LO	A2	Ko						•																
Lepidocyrtus weidneri	Collembola	LO	A2	Ko																						
Lepidotheca suaveolens	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 C3 B_2/$B_3$2	K Ky F Ko Å Fl B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
Leptomastix dactylopii	Hymenoptera	LO	A3	K Å																						
Leucanthemum ×superbum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$3	Ko	•	•			•	•				•		•	•				•					
Leucoagaricus americanus	Fungi	LO	A4	Ko	•	•			•	•		•														
Leucocoprinus cretaceus	Fungi	LO	A4	Ko		•				•																
Leucojum vernum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	S Ko		•							•		•		•									
Levisticum officinale	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	K S Ko B	•	•	•	•	•	•	•	•	•					•		•	•					
Lolium multiflorum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	Ko Å	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•				

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Lonicera alpigena	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	S		•																				
Lonicera morrowii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$2 G2	Ko						•																
Lonicera nigra	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	S	•	•	•	•																		
Lotus pedunculatus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	K F Ko Å	•	•	•		•	•	•	•	•		•											
Luzula forsteri	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K S Ko					•		•															
Luzula luzuloides	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	K S Ko	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•				
Lysichiton americanus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2 E2	S Fl								•			•										
Macrolophus melanotoma	Hemiptera	LO	H3	K																						
Macropsis graminea	Hemiptera	LO	A3 $B_1$3	K Ko Å	•	•					•															
Macrosiphoniella sanborni	Hemiptera	LO	A3	Å		•		•						•	•							•				
Macrosiphum euphorbiae	Hemiptera	LO	A3	Å	•	•	•	•	•	•	•		•	•	•	•		•	•	•	•					
Malus sieboldii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3 E2	S Ko Fl	•	•			•						•											
Malva moschata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 C2 B_2/$B_3$2 E2	K Ky Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
Medicago sativa ×varia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	K Ko	•	•			•	•	•	•														
Medicago sativa falcata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	K Ko Å	•	•			•	•	•	•	•	•	•			•								
Medicago sativa sativa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	Ko Å	•	•	•	•	•	•	•	•	•	•	•	•		•	•							
Melica altissima	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S Ko		◦																				
Melica ciliata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	B						•																
Melilotus officinalis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2 E2	F Ko Å B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Mentha ×gracilis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	K Ko Å Fl		•			•	•	•		•	•	•			•		•						
Mentha spicata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko	•	•	•		•	•	•	•	•		•			•								
Mercurialis annua	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko Å							•	•	•	•												
Meria laricis	Fungi	LO	A4	K S		•		•							•	•	•									
Micromys minutus	Mammalia	LO	A4 $B_1$2	K Å			•																			
Mimulus luteus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	K Ko Fl			•	•								•	•	•		•						
Mitostoma chrysomelas	Arachnida	LO	A3 E2	Ko	•									•												
Molgula manhattensis	Branchiopoda, Echinodermata, Tunicata	LO	A3 E2	M														•								
Myosotis sparsiflora	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	S Ko		•																				
Myrmecocephalus concinnus	Coleoptera	LO	A3 $B_1$2	K S Ko		•																				
Myzus ascalonicus	Hemiptera	LO	A3	Å	•	•				•				•	•				•							
Nasturtium officinale	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$3	Ko Fl	•				•					•												
Necrobia violacea	Coleoptera	LO	A4 $B_1$2 C2	Ko																						
Nematostoma parasiticum	Fungi	LO	A4	S									•		•											
Nematus spiraeae	Hymenoptera	LO	A2	Ko																						
Nepeta cataria	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	S Ko Å B	•	•	•			•	•		•													
Nezara viridula	Hemiptera	LO	E2	Ko																						
Niptus hololeucus	Coleoptera	LO	A4 $B_1$2 C2	Ko	•	•	•	•	•			•	•	•	•	•	•	•		•	•	•				

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Nonea versicolor	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko Å		•	•	•					•													
Oenothera biennis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ky Ko Å B	•	•	•		•	•	•	•	•				•	•								
Oenothera canovirens	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K Ko Å						•	•															
Oligota parva	Coleoptera	LO	A3 $B_1$2 C2	Ko																						
Onchocleidus similis	Platyhelminthes	LO	A4			•																				
Onchocleidus sp.	Platyhelminthes	LO	A4			•																				
Onychiurus folsomi	Collembola	LO	A2	Ko											•											
Onychiurus normalis	Collembola	LO	A2	Ko		•									•											
Opsius stactogalus	Hemiptera	LO	A3	Ko																						
Orchesella quinquefasciata	Collembola	LO	A2	Ko Å																						
Ornithogalum angustifolium	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ky S Ko Fl B	•	•			•	•	•	•	•	•												
Oryctes nasicornis	Coleoptera	LO	A4 $B_1$2		•	•	•	•	•	•	•	•														
Oryctolagus cuniculus	Mammalia	LO	A3												•											
Otiorhynchus armadillo	Coleoptera	LO	A3 G2	K Ko Å		•																				
Ovibos moschatus	Mammalia	LO	A4 $B_1$2 C2 E2 I2				•											•								
Oxytelus migrator	Coleoptera	LO	A2 $B_1$2	K Ko Å																						
Papaver atlanticum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$3	Ko						•																
Papaver pseudoorientale	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	K S Ko		•		•	•	•				•						•	•					
Papaver rhoeas	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko Å	•	•	•	•	•	•	•	•	•	•				•			•					
Parietaria pensylvanica	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko		•																				
Parthenolecanium pomeranicum	Hemiptera	LO	A3	K		•																				
Pastinaca sativa sativa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2	Ko	•						•	•														
Petricolaria pholadiformis	Mollusca	LO	A3 E2	M								•														
Peziza cerea	Fungi	LO	A4	Ko	•	•				•		•	•	•	•		•	•		•						
Phaeocryptopus gaeumannii	Fungi	LO	A4	K S		•									•		•									
Phasianus colchicus	Aves	LO	A4	K S	•	•	•	•	•	•	•	•	•	•	•		•	•	•							
Phedimus kamtschaticus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2	Ko B		•																				
Phellinus tuberculosus	Fungi	LO	A4 $B_1$2 E2	S Ko B	•	•			•	•		•		•	•											
Philadelphus coronarius	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S Ko		•			•	•		•	•	•	•	•		•								
Pholcus phalangioides	Arachnida	LO	A4 $B_1$2	Ko		•									•					•						
Phyllobius intrusus	Coleoptera	LO	A3 $B_1$3 C2 E2	S Ko									•													
Phyllodrepa puberula	Coleoptera	LO	A3 $B_1$2 C2	Ko																						
Phylloporia ribis	Fungi	LO	A4 E2	S Ko	•	•			•		•		•	•	•			•		•						
Physalis alkekengi	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	Ko Å	•	•	•			•	•		•													
Physocarpus opulifolius	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	K S Ko	•	•			•			•	•				•									
Phyteuma spicatum caeruleum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K														•								
Phytophthora fragariae	Fungi	LO	A4 $B_1$2 E2	K S			•			•		•	•	•	•		•									
Phytophthora rubi	Fungi	LO	A4 $B_1$2 C2 E2	K B	•		•	•	•						•	•	•									
Picea ×lutzii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2 E2	S										•	•	•				•	•					
Picea engelmannii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2 E2	S	•		•	•	•			•			•	•		•	•	•						
Picea pungens	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	S	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Piezodorus lituratus	Hemiptera	LO	A3 $B_1$2 C2	K S Ko Å																						
Pimpinella major	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ko		•			•	•												•				

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Pinus mugo uncinata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4	S	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•					
Pinus nigra	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S	•	•			•	•	•															
Pinus sibirica	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	S			•	•	•									•	•	•	•	•				
Pisolithus arhizus	Fungi	LO	A3 E2	Ko					•																	
Planorbarius corneus	Mollusca	LO	A4 E2	L		•				•					•											
Planorbis carinatus	Mollusca	LO	A3 E2	L																						
Poa chaixii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K S Ko	•	•				•	•	•	•	•	•			•								
Poa supina	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ko Å														•	•							
Podosphaera mors-uvae	Fungi	LO	A4 $B_1$2 C2 E2	K S Å	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Populicerus nitidissimus	Hemiptera	LO	A3 $B_1$3	K Ko Å	•	•			•	•	•			•												
Populus alba	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko	•	•				•	•		•				•									
Populus trichocarpa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	Ko	•	•				•																
Porcellionides pruinosus	Crustacea	LO	A4	Ko	•	•												•								
Potentilla recta	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K Ko Å	•	•	•		•	•	•	•	•					•								
Potentilla reptans	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4	F Ko	•	•			•	•	•	•	•													
Pristiphora angulata	Hymenoptera	LO	A4 $B_1$2	K Ko																						
Pristiphora erichsonii	Hymenoptera	LO	A4 $B_1$2	S																						
Pristiphora wesmaeli	Hymenoptera	LO	A4 $B_1$2 E2	S																						
Proisotoma subminuta	Collembola	LO	A2	Ko						•																
Protaphorura fimata	Collembola	LO	A2	Ko						•					•											
Prunus domestica insititia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S	•	•	•			•	•	•	•					•								
Prunus mahaleb	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S B	•	•				•																
Prunus virginiana	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S Ko		•			•																	
Pseudotsuga menziesii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	S	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Psilochorus simoni	Arachnida	LO	A4	Ko											•											
Psilocybe cyanescens	Fungi	LO	A2	Ko									•													
Psylla buxi	Hemiptera	LO	A3 E2	Ko																						
Ptinus fur	Coleoptera	LO	A4	Ko																						
Pulmonaria affinis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	K S Ko	•	•								•	•			•			•					
Quercus cerris	Magnoliophyta, Pinophyta, Pteridophyta	LO	I2	S		•																				
Quercus rubra	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S		•			•		•		•		•											
Reseda lutea	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko Å B	•	•	•	•		•	•		•								•					
Rhabdocline pseudotsugae	Fungi	LO	A4	S	•	•						•	•	•	•	•	•									
Rhytidodus decimusquartus	Hemiptera	LO	A3 $B_1$3	K Ko Å		•			•		•															
Ribes divaricatum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S Ko		•						•	•													
Ribes odoratum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	Ko B		•					•		•			•										
Ribes uva-crispa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	K Ky S Ko B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Ricciocarpos natans	Anthocerotophyta, Bryophyta, Marchantiophyta	LO	A4 $B_1$2 E2																							
Rosa acicularis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$2 G2	K S Ko																	•					
Rosa 'Hollandica'	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	Ko		•			•		•					•	•	•		•						

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Rosa pendulina	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S														•			•					
Rubus spectabilis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S Ko	•				•					•	•	•	•									
Rumex confertus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K Ko														•		•		•				
Rumex patientia patientia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko	•	•																				
Salix ×mollissima	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	Ky S V Ko Fl									•	•												
Salix alaxensis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	Ko														•		•	•	•				
Salix purpurea	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4	K S Ko Fl	•	•	•	•	•	•	•		•	•	•											
Salvelinus fontinalis	"Pisces"	LO	A4 E2			•		•	•		•	•	•	•												
Sambucus nigra	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2 E2	K S Ko Å	•	•			•	•	•	•	•	•	•	•	•	•	•	•						
Sambucus pubens	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko																	•					
Sanguisorba minor minor	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	K Ko B	•	•			•																	
Scleranthus annuus annuus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko	•	•	•	•	•	•	•	•	•	•	•	•	•	•								
Scrophularia chrysantha	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	S Ko		•				•																
Scutellaria altissima	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2	K Ko		•																				
Securigera varia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko	•	•				•	•	•	•	•				•								
Sempervivum tectorum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2 E2 G2	K Ky F Ko B	•	•			•	•	•	•	•													
Senecio ovatus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S Ko								•					•					•				
Sinella curviseta	Collembola	LO	A2	Ko											•											
Sinella tenebricosa	Collembola	LO	A2	Ko		•									•											
Sisymbrium altissimum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2	F Ko Å	•	•	•		•	•			•	•	•	•										
Sisymbrium loeselii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	F Ko Å B		•			•	•	•				•	•										
Sminthurinus niger	Collembola	LO	A2	Ko																						
Sminthurinus trinotatus	Collembola	LO	A2	Ko																						
Solanum nigrum schultesii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$4	Ko		•			•	•	•															
Sorbus koehneana	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	S Ko																						
Spiraea ×arguta	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$4	S Ko	•	•	•		•	•			•				•									
Spiraea ×bumalda	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko									•		•											
Spiraea ×cinerea	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$2	Ko	•	•						•	•			•										
Spiraea ×pseudosalicifolia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$2	Ko		•																				
Spiraea ×vanhouttei	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$3	S Ko	•	•			•		•		•	•			•									
Spiraea alba	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	K S Ko		•	•			•			•	•												
Spiraea douglasii	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	Ko		•				•		•	•		•		•									
Spiraea media	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 $B_2/B_3$2	K S		•														•						
Spiraea salicifolia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 $B_2/B_3$2	Ko Fl B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Spiraea tomentosa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 $B_2/B_3$2	Fl									•													

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Spiraea trilobata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$2	S B		•														•	•					
Stenidiocerus poecilus	Hemiptera	LO	A3 $B_1$3	K Ko Å	•	•			•	•	•															
Strobilomyia laricicola	Diptera	LO	A3 $B_1$2	S																						
Stromatinia cepivora	Fungi	LO	A4 $B_1$2 C2 G2	S																						
Strongyloides stercoralis	Nematoda	LO	A2 $B_1$4 I2			•														•						
Stropharia rugosoannulata	Fungi	LO	A4	S Ko						•		•									•					
Stropholoma aurantiaca	Fungi	LO	A4	Ko						•		•														
Stropholoma percevalii	Fungi	LO	A4 C2 E2	S Ko Fl	•	•			•	•		•								•						
Tanacetum coccineum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$2	S Ko Å			•																			
Tanacetum macrophyllum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko		•																				
Tanacetum parthenium	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	Ko	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•					
Taphrina acericola	Fungi	LO	A4	S		•	•	•		•		•		•	•		•	•	•							
Tegenaria atrica	Arachnida	LO	A4	Ko	•	•				•	•		•	•	•					•							
Tegenaria domestica	Arachnida	LO	A4 $B_1$2	Ko B	•	•			•	•	•	•	•	•	•											
Telmatogeton japonicus	Diptera	LO	$B_1$4	F										•												
Thalassaphorura encarpata	Collembola	LO	A2	Ko											•											
Thalictrum aquilegifolium	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S F Ko Å	•	•			•			•	•	•	•	•				•	•					
Thalictrum minus minus	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko					•		•															
Thecturota marchii	Coleoptera	LO	A3	K Ko Å		•	•																			
Thoracochaeta seticosta	Diptera	LO	A3 $B_1$2	F													•									
Thuja occidentalis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2 G2	S Ko	•	•	•		•						•	•		•	•	•						
Thuja plicata	Magnoliophyta, Pinophyta, Pteridophyta	LO	A4 B_2/$B_3$2	S Ko	•	•			•	•	•	•	•	•	•	•	•	•		•						
Tremulicerus fulgidus	Hemiptera	LO	A3 $B_1$3	K Ko Å		•			•																	
Trichoniscoides sarsi	Crustacea	LO	A4	S Ko B		•					•															
Trioza apicalis	Hemiptera	LO	A4	Å	•	•	•	•	•	•	•	•	•					•	•							
Trisetum flavescens	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko Å		•				•	•	•				•	•									
Tulipa tarda	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko		•												•								
Turritis brassica	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$3	S Ko		•																				
Typhaea haagi	Coleoptera	LO	A2 $B_1$2	Ko																						
Ulmus laevis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S Ko B		•																				
Ulmus minor	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S		•																				
Veratrum album	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	S					•																	
Veronica austriaca austriaca	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	K Ko B		•						•	•													
Veronica austriaca teucrium	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko	•	•		•	•	•			•	•												
Veronica hederifolia hederifolia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	F Ko Å	•						•	•	•					•	•							
Veronica hederifolia lucorum	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko	•									•												
Vicia sativa segetalis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko Å	•	•	•		•	•		•	•	•			•	•								
Vicia tenuifolia	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3 B_2/$B_3$2	Ko	•	•				•	•			•												
Vicia villosa	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko Å	•	•				•	•			•				•								
Viola suavis	Magnoliophyta, Pinophyta, Pteridophyta	LO	A3	Ko							•															
Viviparus viviparus	Mollusca	LO	A4 E2	L		•			•																	

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Vulpia myuros	Magnoliophyta, Pinophyta, Pteridophyta	LO	A2 B_2/$B_3$3	Ko	•	•			•	•			•	•												
Zonitoides arboreus	Mollusca	LO	A4	Ko	•	•			•			•														
No known impact (NK)																										
Abies mariesii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Agrocybe cylindrica	Fungi	NK		Ko	◦								◦													
Agrocybe tabacina	Fungi	NK		Å						•																
Ajuga genevensis	Magnoliophyta, Pinophyta, Pteridophyta	NK													•											
Alcea rosea	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•																
Alectoris chukar	Aves	NK		K Å	•				•	•			•													
Allium angulosum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Allium carinatum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Allium scorodoprasum rotundum	Magnoliophyta, Pinophyta, Pteridophyta	NK									•															
Amaranthus blitoides	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•																				
Amaranthus hybridus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•			•	•	•											
Amaranthus retroflexus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•			•	•				•								
Ambrosia artemisiifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK		Ko	•	•	•		•	•	•	•	•	•	•	•		•		•		•				
Ambrosia psilostachya	Magnoliophyta, Pinophyta, Pteridophyta	NK											◦													
Amelanchier ovalis	Magnoliophyta, Pinophyta, Pteridophyta	NK													◦											
Anchusa azurea	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Androsace elongata	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Anemone apennina	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Anemone blanda	Magnoliophyta, Pinophyta, Pteridophyta	NK					•											•								
Anthemis cotula	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•	•		•	•												
Anthemis ruthenica	Magnoliophyta, Pinophyta, Pteridophyta	NK			•					•			•								•					
Anthriscus cerefolium	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•		•	•												
Antirrhinum majus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•			•	•												
Antithamnion nipponicum	Algae	NK		M											•											
Aphanes arvensis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•									•												
Arabidopsis halleri	Magnoliophyta, Pinophyta, Pteridophyta	NK												◦	◦											
Aralia racemosa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Aremonia agrimonioides	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Artemisia abrotanum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•							•													
Artemisia pontica	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Artemisia siversiana	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Arum maculatum	Magnoliophyta, Pinophyta, Pteridophyta	NK											•	•												
Asarum canadense	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				

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Aster alpinus	Magnoliophyta, Pinophyta, Pteridophyta	NK															◦									
Aster amellus	Magnoliophyta, Pinophyta, Pteridophyta	NK											•													
Atropa belladonna	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Avena strigosa	Magnoliophyta, Pinophyta, Pteridophyta	NK			◦	◦			◦	◦	◦	◦	◦	◦	◦			◦	◦							
Ballota nigra nigra	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•																
Balsamita major	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Barypeithes mollicomus	Coleoptera	NK		K Ko Å																						
Borago officinalis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•	•	•	•	•	•	•	•	•	•	•	•								
Bostrichus capucinus	Coleoptera	NK		Ko														•								
Brassica adpressa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•	•		•	•	•			•								
Brassica elongata integrifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK			•						•															
Brassica juncea	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•	•			•	•											
Brassica napus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•				
Brassica nigra	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•			•	•												
Brassica oleracea	Magnoliophyta, Pinophyta, Pteridophyta	NK							•	•			•	•			•			•	•					
Brassica rapa oleifera	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•						•					•			•					
Brassica rapa rapa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•						•				•	•			•					
Bromopsis erecta	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•																
Bromopsis pubescens	Magnoliophyta, Pinophyta, Pteridophyta	NK				•					•															
Bromus commutatus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•					•	•			•	•			•								
Calendula arvensis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Calendula officinalis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•	•	•	•	•	•	•			•		•			•					
Camelina alyssum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•																
Camelina microcarpa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•			•												
Camelina sativa	Magnoliophyta, Pinophyta, Pteridophyta	NK											•	•												
Campanula glomerata glomerata	Magnoliophyta, Pinophyta, Pteridophyta	NK							•													•				
Capnoides sempervirens	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Caragana frutex	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Cardamine parviflora	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦							◦	◦												
Carduus acanthoides	Magnoliophyta, Pinophyta, Pteridophyta	NK			•				•	•	•															
Carduus nutans	Magnoliophyta, Pinophyta, Pteridophyta	NK												•												
Carduus thoermeri	Magnoliophyta, Pinophyta, Pteridophyta	NK						•																		
Carex pendula	Magnoliophyta, Pinophyta, Pteridophyta	NK												•												
Carex praecox	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Carex strigosa	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				

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Carlina acaulis	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Castanea sativa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•							•														
Centaurea dealbata	Magnoliophyta, Pinophyta, Pteridophyta	NK				•					•			•				•	•							
Centaurea stoebe	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Centaurea triumfettii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•											•	•			•					
Cephalaria gigantea	Magnoliophyta, Pinophyta, Pteridophyta	NK					•																			
Chaerophyllum aromaticum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Chaerophyllum aureum	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Chaerophyllum bulbosum	Magnoliophyta, Pinophyta, Pteridophyta	NK									•															
Chaerophyllum prescottii	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦					◦				◦			◦								
Chaerophyllum temulum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•				•													
Chaetanaphothrips orchidii	Thysanoptera	NK		Ko Å						•																
Chamaecytisus ×versicolor	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Chamaecytisus glaber	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Chamaespartium sagittale	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Chelone glabra	Magnoliophyta, Pinophyta, Pteridophyta	NK															•									
Chenopodium ficifolium	Magnoliophyta, Pinophyta, Pteridophyta	NK			•											•										
Chenopodium hybridum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•		•	•																
Chenopodium rubrum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•	•	•		•				•								
Chlorophyllum brunneum	Fungi	NK		Ko		•																				
Cirsium dissectum	Magnoliophyta, Pinophyta, Pteridophyta	NK										◦														
Claytonia perfoliata	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•			•					•			•								
Clematis recta	Magnoliophyta, Pinophyta, Pteridophyta	NK												•												
Coincya monensis	Magnoliophyta, Pinophyta, Pteridophyta	NK											•													
Colchicum autumnale	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•		•														
Commelina communis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•				•	•																
Conium maculatum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•	•	•	•	•				•								
Coreopsis grandiflora	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Coriandrum sativum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•			•	•				•			•					
Cornu aspersum	Mollusca	NK		K Ko		◦					◦															
Coronopus squamatus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•							•													
Corydalis angustifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Corydalis nobilis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Corydalis wendelboi	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Cotoneaster hjelmqvistii	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				

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Cotoneaster ignescens	Magnoliophyta, Pinophyta, Pteridophyta	NK									•															
Cotoneaster latifolius	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Cotula coronopifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK		F Ko						•						•										
Crepis capillaris	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Crepis setosa	Magnoliophyta, Pinophyta, Pteridophyta	NK				•					•		•	•												
Crocus ×stellaris	Magnoliophyta, Pinophyta, Pteridophyta	NK				•							•					•								
Crocus chrysanthus	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Crocus flavus	Magnoliophyta, Pinophyta, Pteridophyta	NK											•				•									
Crocus speciosus	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Cryptolaemus montrouzieri	Coleoptera	NK		K Ko																						
Cryptops parisi	Myriapoda	NK		S Ko B																						
Cuscuta epithymum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•					•	•															
Cyathus stercoreus	Fungi	NK		Ko		◦								◦												
Cylindroiulus truncorum	Myriapoda	NK		Ko					•																	
Delphinium ×cultorum	Magnoliophyta, Pinophyta, Pteridophyta	NK					•	•	•				•					•		•	•	•				
Delphinium elatum	Magnoliophyta, Pinophyta, Pteridophyta	NK																				•				
Dermestes peruvianus	Coleoptera	NK		Ko																						
Diervilla florida	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Digitalis lanata	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Digitalis lutea	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Digitaria ischaemum	Magnoliophyta, Pinophyta, Pteridophyta	NK							•					•												
Dinoderus minutus	Coleoptera	NK																								
Diplotaxis tenuifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•			•	•	•											
Dipsacus fullonum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•		•	•					•								
Dipsacus strigosus	Magnoliophyta, Pinophyta, Pteridophyta	NK				•			•					•												
Doronicum ×excelsum	Magnoliophyta, Pinophyta, Pteridophyta	NK											•								•	•				
Doronicum pardalianches	Magnoliophyta, Pinophyta, Pteridophyta	NK										•	•			•			•	•	•					
Doronicum plantagineum	Magnoliophyta, Pinophyta, Pteridophyta	NK											◦													
Dracocephalum parviflorum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•									•					•							
Dracocephalum thymiflorum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•		•																		
Duchesnea indica	Magnoliophyta, Pinophyta, Pteridophyta	NK							•	•																
Epilobium brunnescens	Magnoliophyta, Pinophyta, Pteridophyta	NK												•	•											
Epimedium alpinum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•																
Epimedium pinnatum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Eriosoma lanigerum	Hemiptera	NK		Å	•							•		•			•									
Erucastrum gallicum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•				•				•								

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Eryngium alpinum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Erythronium dens-canis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Euonymus latifolius	Magnoliophyta, Pinophyta, Pteridophyta	NK					•					•														
Eupatorium purpureum	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Euphorbia amygdaloides	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Euphorbia chamaesyce	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Euphorbia dulcis	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Euphorbia epithymoides	Magnoliophyta, Pinophyta, Pteridophyta	NK							•	•																
Euphorbia lathyris	Magnoliophyta, Pinophyta, Pteridophyta	NK								•						•										
Feltiella acarisuga	Diptera	NK		Ko Å																						
Festuca gautieri	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Festuca heterophylla	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Fibrodontia gossypina	Fungi	NK								•																
Filipendula purpurea	Magnoliophyta, Pinophyta, Pteridophyta	NK														•	•									
Filipendula rubra	Magnoliophyta, Pinophyta, Pteridophyta	NK									•	•														
Fragaria ×ananassa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•	•	•	•	•		•			•			•	•	•					
Fragaria chiloënsis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•			•			•														
Fritillaria meleagris	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•						•		•			•								
Fumaria vaillantii	Magnoliophyta, Pinophyta, Pteridophyta	NK											•													
Gaillardia ×grandiflora	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•				•												
Galanthus elwesii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Galega officinalis	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Galega orientalis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•					•									•							
Galeopsis pubescens	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Galium pumilum	Magnoliophyta, Pinophyta, Pteridophyta	NK						•																		
Galium pycnotrichum	Magnoliophyta, Pinophyta, Pteridophyta	NK			◦																					
Galium rivale	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Galium rotundifolium	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Gamochaeta purpurea	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Genista tinctoria	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•	•		•													
Geranium endressii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•											•									
Geranium macrorrhizum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•																				
Geranium pylzowianum	Magnoliophyta, Pinophyta, Pteridophyta	NK													•											
Gypsophila repens	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦					◦															

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Helianthus tuberosus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•		•			•										
Helicella itala	Mollusca	NK		Ky B		◦																				
Hesperis tristis	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦		◦	◦				◦													
Heuchera sanguinea	Magnoliophyta, Pinophyta, Pteridophyta	NK				•			•	•	•				•						•					
Hyacinthoides italica	Magnoliophyta, Pinophyta, Pteridophyta	NK												◦												
Hydrangea macrophylla	Magnoliophyta, Pinophyta, Pteridophyta	NK			•								•													
Hydrangea petiolaris	Magnoliophyta, Pinophyta, Pteridophyta	NK				•						•														
Hydrophyllum virginianum	Magnoliophyta, Pinophyta, Pteridophyta	NK																•								
Hylotelephium ruprechtii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Iberis amara	Magnoliophyta, Pinophyta, Pteridophyta	NK								•		•		•												
Iberis sempervirens	Magnoliophyta, Pinophyta, Pteridophyta	NK				•					•		•													
Iberis umbellata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•		•	•	•	•			•								
Impatiens cristata	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Inula britannica	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Iris ×germanica	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•			•		•	•													
Iris chrysographes	Magnoliophyta, Pinophyta, Pteridophyta	NK												•												
Iris pumila	Magnoliophyta, Pinophyta, Pteridophyta	NK			•				•		•			•												
Iris versicolor	Magnoliophyta, Pinophyta, Pteridophyta	NK																								
Juglans regia	Magnoliophyta, Pinophyta, Pteridophyta	NK				•					•			•			•									
Kalmia angustifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK		V		•																				
Koeleria pyramidata	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Kolkwitzia amabilis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•					•				•								
Kryphioiulus occultus	Myriapoda	NK		Ko								•														
Lamiastrum galeobdolon argentatum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Lamium amplexicaule orientale	Magnoliophyta, Pinophyta, Pteridophyta	NK										•														
Lamium maculatum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•		•			•										
Lamprocapnos spectabilis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•			•		•	•					•					
Leonurus cardiaca villosus	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•			•		•	•	•												
Lepidium cordatum	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Lepidium neglectum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•		•	•	•	•		•		•											
Lepidium sativum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•				•	•	•	•	•		•			•			•					
Lepidosaphes newsteadi	Hemiptera	NK		Ko Å		•																				
Ligularia przewalskii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•								•						•						
Ligularia sibirica	Magnoliophyta, Pinophyta, Pteridophyta	NK																			•					
Lilium candidum	Magnoliophyta, Pinophyta, Pteridophyta	NK										•														

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Lilium lancifolium	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•																				
Lilium pensylvanicum	Magnoliophyta, Pinophyta, Pteridophyta	NK											•													
Lobularia maritima	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•		•	•	•		•		•								
Lonicera japonica	Magnoliophyta, Pinophyta, Pteridophyta	NK													•											
Lonicera korolkowii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Lonicera sempervirens	Magnoliophyta, Pinophyta, Pteridophyta	NK										•														
Lotus glaber	Magnoliophyta, Pinophyta, Pteridophyta	NK							•					•												
Lotus subbiflorus	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Luzula nivea	Magnoliophyta, Pinophyta, Pteridophyta	NK								•				•												
Lychnis chalcedonica	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•			•			•													
Lychnis coronaria	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•	•	•	•												
Lysimachia ciliata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•									•	•											
Lythrum virgatum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•	•	•														
Maianthemum racemosum	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Maianthemum stellatum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Malus baccata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•							•													
Malus floribunda	Magnoliophyta, Pinophyta, Pteridophyta	NK				•									•											
Malus pumila	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Malus sargentii	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Malva alcea	Magnoliophyta, Pinophyta, Pteridophyta	NK				•			•																	
Malva verticillata	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•																			
Meligethes maurus	Coleoptera	NK		K Ko Å																						
Mentha ×smithiana	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Mentha ×villosa	Magnoliophyta, Pinophyta, Pteridophyta	NK																•								
Mentha canadensis	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Mesocolopus collaris	Coleoptera	NK				•																				
Myosotis alpestris	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•		•					•												
Nepeta grandiflora	Magnoliophyta, Pinophyta, Pteridophyta	NK																			•					
Neslia paniculata	Magnoliophyta, Pinophyta, Pteridophyta	NK			◦	◦		◦	◦		◦	◦		◦	◦	◦		◦	◦			◦				
Nicandra physalodes	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•	•		•	•					•							
Oenothera casimiri	Magnoliophyta, Pinophyta, Pteridophyta	NK							•	•																
Oenothera depressa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Oenothera rubricauloides	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•																
Oenothera scandinavica	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																

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Ononis spinosa spinosa	Magnoliophyta, Pinophyta, Pteridophyta	NK			•					•	•															
Orius insidiosus	Hemiptera	NK		K Ko Å																						
Ornithogalum nutans	Magnoliophyta, Pinophyta, Pteridophyta	NK										•	•													
Ornithopus compressus	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Ornithopus sativus	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Orobanche caryophyllacea	Magnoliophyta, Pinophyta, Pteridophyta	NK																◦								
Orobanche elatior	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Orobanche hederae	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Orobanche lucorum	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Oxalis corniculata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•		•	•												
Oxalis dillenii	Magnoliophyta, Pinophyta, Pteridophyta	NK			•		•			•																
Papaver alpinum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Papaver bracteatum	Magnoliophyta, Pinophyta, Pteridophyta	NK								•	•	•	•	•				•			•					
Papaver dubium dubium	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•			•					•								
Parasenecio hastatus	Magnoliophyta, Pinophyta, Pteridophyta	NK																			•					
Parthenocissus inserta	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•	•	•	•	•	•														
Pentaglottis sempervirens	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•							•	•	•											
Petroselinum crispum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•				•	•	•		•	•												
Phacelia tanacetifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•	•	•	•	•	•	•	•	•			•	•					
Phedimus stoloniferus	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Philadelphus lewisii	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Phlox paniculata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•						•	•													
Phyteuma nigrum	Magnoliophyta, Pinophyta, Pteridophyta	NK																				•				
Picea omorika	Magnoliophyta, Pinophyta, Pteridophyta	NK					•																			
Pieris japonica	Magnoliophyta, Pinophyta, Pteridophyta	NK				•									•											
Plantago sp.	Magnoliophyta, Pinophyta, Pteridophyta	NK							•	•																
Polemonium reptans	Magnoliophyta, Pinophyta, Pteridophyta	NK									•															
Polistes nimpha	Hymenoptera	NK			K Ko Å																					
Populus ×canadensis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•									•				•								
Populus ×canescens	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•																	
Populus laurifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•					•												
Populus nigra	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•		•		•												
Populus simonii	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Portulaca oleracea oleracea	Magnoliophyta, Pinophyta, Pteridophyta	NK				•			•	•																

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Potentilla anglica	Magnoliophyta, Pinophyta, Pteridophyta	NK									•															
Potentilla inclinata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•																
Potentilla norvegica hirsuta	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Prenanthes purpurea	Magnoliophyta, Pinophyta, Pteridophyta	NK													•											
Pulmonaria officinalis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•								•													
Pulmonaria saccharata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•							•													
Pulsatilla vulgaris	Magnoliophyta, Pinophyta, Pteridophyta	NK								•				•												
Ranunculus aconitifolius	Magnoliophyta, Pinophyta, Pteridophyta	NK			•												•	•		•	•					
Ranunculus acris friesianus	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Ranunculus lanuginosus	Magnoliophyta, Pinophyta, Pteridophyta	NK											•													
Ranunculus serpens	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Reseda luteola	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•			•													
Rhododendron brachycarpum	Magnoliophyta, Pinophyta, Pteridophyta	NK													•		•									
Rhododendron sutchuenense	Magnoliophyta, Pinophyta, Pteridophyta	NK													•											
Rhus typhina	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•			•	•	•	•														
Rodgersia podophylla	Magnoliophyta, Pinophyta, Pteridophyta	NK													•	•	•				•					
Rosa carolina	Magnoliophyta, Pinophyta, Pteridophyta	NK											•													
Rosa davurica	Magnoliophyta, Pinophyta, Pteridophyta	NK				•										•										
Rosa nitida	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Rubus allegheniensis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•								•												
Rubus bifrons	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus dasyphyllus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus echinatus	Magnoliophyta, Pinophyta, Pteridophyta	NK															•									
Rubus euryanthemus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus glandulosus	Magnoliophyta, Pinophyta, Pteridophyta	NK																								
Rubus hartmanii	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus leptothyrsus	Magnoliophyta, Pinophyta, Pteridophyta	NK							•																	
Rubus pedemontanus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus pyramidalis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus rudis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus sciocharis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus sylvaticus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rubus tuberculatus	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Rudbeckia hirta	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•			•																

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Rudbeckia laciniata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•	•	•			•														
Salix ×alopecuroides	Magnoliophyta, Pinophyta, Pteridophyta	NK						•						•												
Salix ×rubra	Magnoliophyta, Pinophyta, Pteridophyta	NK			•					•		•														
Salix ×sepulcralis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•			•																	
Salix acutifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK				•			•					•												
Salvia nemorosa	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Salvia pratensis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Salvia verticillata	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•								•							
Sanguisorba canadensis canadensis	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Sanguisorba canadensis latifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK																			•					
Saponaria ocymoides	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Saxifraga ×arendsii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•											•		•	•					
Saxifraga ×urbium	Magnoliophyta, Pinophyta, Pteridophyta	NK																			•					
Sedum lydium	Magnoliophyta, Pinophyta, Pteridophyta	NK		Ko						•																
Selenothrips rubrocinctus	Thysanoptera	NK		Ko Å										•												
Senecio erucifolius	Magnoliophyta, Pinophyta, Pteridophyta	NK			•																					
Senecio subalpinus	Magnoliophyta, Pinophyta, Pteridophyta	NK																			•					
Senecio vernalis	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•		•	•	•		•	•	•	•	•	•	•			•	•				
Sibbaldianthe bifurca	Magnoliophyta, Pinophyta, Pteridophyta	NK									•															
Silene csereii	Magnoliophyta, Pinophyta, Pteridophyta	NK									•			•												
Silene gallica	Magnoliophyta, Pinophyta, Pteridophyta	NK									•		•	•												
Sinacalia tangutica	Magnoliophyta, Pinophyta, Pteridophyta	NK													•						•					
Sinoxylon anale	Coleoptera	NK																								
Sisymbrium orientale	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•				•	•		•	•												
Sisymbrium strictissimum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Sisyrinchium montanum	Magnoliophyta, Pinophyta, Pteridophyta	NK							•		•			•												
Solanum americanum	Magnoliophyta, Pinophyta, Pteridophyta	NK			•					•					•											
Sorbus commixta	Magnoliophyta, Pinophyta, Pteridophyta	NK													•											
Stachys annua	Magnoliophyta, Pinophyta, Pteridophyta	NK				•	•						•	•												
Stachys arvensis	Magnoliophyta, Pinophyta, Pteridophyta	NK											•													
Stachys germanica	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Stigmatogaster subterraneus	Myriapoda	NK		Ko																						
Symphoricarpos orbiculatus	Magnoliophyta, Pinophyta, Pteridophyta	NK										◦														
Symphyotrichum cordifolium	Magnoliophyta, Pinophyta, Pteridophyta	NK				•						•														

Scientific name	Species group	Category	Criteria*	Main habitat	Østfold	Oslo og Akershus	Hedmark	Oppland	Buskerud	Vestfold	Telemark	Aust Agder	Vest Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark	The Barents Sea	The Arctic Ocean	The Norwegian sea	The North Sea
Symphyotrichum lanceolatum	Magnoliophyta, Pinophyta, Pteridophyta	NK									•	•														
Symphyotrichum novae-angliae	Magnoliophyta, Pinophyta, Pteridophyta	NK			•								•													
Temnothorax crassispinus	Hymenoptera	NK		S																						
Temnothorax unifasciatus	Hymenoptera	NK		S																						
Tephroseris palustris	Magnoliophyta, Pinophyta, Pteridophyta	NK								◦	◦															
Thalictrum delavayi	Magnoliophyta, Pinophyta, Pteridophyta	NK												•		•										
Tiarella cordifolia	Magnoliophyta, Pinophyta, Pteridophyta	NK				◦																				
Trifolium pannonicum	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Trifolium spadiceum	Magnoliophyta, Pinophyta, Pteridophyta	NK		Ko Å	•			•	•	•	•							•								
Tripterygium regelii	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Tsuga canadensis	Magnoliophyta, Pinophyta, Pteridophyta	NK				•																				
Verbascum lychnitis	Magnoliophyta, Pinophyta, Pteridophyta	NK						•	•	•																
Verbascum olympicum	Magnoliophyta, Pinophyta, Pteridophyta	NK								•																
Veronica opaca	Magnoliophyta, Pinophyta, Pteridophyta	NK			•	•	•		•																	
Veronica polita	Magnoliophyta, Pinophyta, Pteridophyta	NK				•				•																
Viola cornuta	Magnoliophyta, Pinophyta, Pteridophyta	NK							•			•		•	•	•	•									
Volvariella volvacea	Fungi	NK		Ko	•	•			•																	
Waldsteinia geoides	Magnoliophyta, Pinophyta, Pteridophyta	NK																								
Xerolenta obvia	Mollusca	NK		B						◦																
SVALBARD																										
Anthriscus sylvestris		HI	A3 E2 F3 G2	Ko																						
Achillea millefolium		LO	A3	Ko																						
Alchemilla subcrenata		LO	A3	Ko																						
Barbarea vulgaris		LO	A3 E2	Ko																						
Microtus levis		LO	A4 I2	Ky																						
Ruderalia		LO	A3	Ko																						
Rumex acetosa		LO	A3	Ko																						
Poa annua		NK		Ko																						
Stellaria media		NK		Ko																						
Tripleurospermum maritimum		NK		Ko																						

* Criterion A and B is not independent of each other. To achieve the maximum effect category in one criterion, the second criterion must have an effect category of 3 or higher. This is shown in the overall subcategory for the invasion axis will not always be as high as the individual effect category for criterion A or B alone. E.g. the fish Leucaspius delineatus has an effect category 4 on criterion A, but an effect category 2 on criterion B, which gives a total subcategory 2 on the invasion axis.

Table 10. Number of 'door knockers', including impact status and basic species information

Categories
SE - severe impact, HI - high impact, PH - potentially high impact, LO - low impact, NK - no known impact

Criteria
A - expected lifetime, B1 - spread velocity, B2 - increase in occupied area, C - colonisation of habitat type,
D - interactions with native threatened or rare species, E - interactions with other species, F - state changes in threatened or rare habitat types,
G - state changes in other habitat types, H - genetic introgression, I - host for parasite or pathogen
Assessment to subcategory 1 for the individual criteria is not presented in the table
* See footnote on connections between criteria A and B on page 130

Main habitats
M - marine, F - tidal zone, Ky - Coast, L - freshwater, Fl - flood (alluvial) zone, V - wetland, S - forest, B - rock, A - arctic alpine, K - semi-natural sites, Å - arable land, KO - constructed sites

Scientific name	Norwegian name	Species group	Category	Criteria*	Main habitat
Severe impact (SE)					
Angiostrongylus vasorum		Nematoda	SE	A4+$B_1$4+D3+E2+I2	
Bursaphelenchus xylophilus		Nematoda	SE	A4+$B_1$4+C4+E3+H3+I4	
Cercopagis pengoi		Crustacea	SE	A3+$B_1$2+C2+D4+E4+G2	
Didemnum vexillum		Branchiopoda, Echinodermata, Tunicata	SE	A3+$B_1$3+C3+D4+E3+G3	M
Dreissena polymorpha		Mollusca	SE	A3+$B_1$4+C3+D4+E4+G4	M L
Echinococcus multilocularis		Platyhelminthes	SE	A4+$B_1$4+C4+D3+E2	
Gammarus tigrinus		Crustacea	SE	A3+$B_1$2+C2+D4+E4+I3	M L
High impact (HI)					
Agrilus anxius	amerikansk bjørkepraktbille	Coleoptera	HI	A2+$B_1$2+C2+E2+G4	S
Agrilus planipennis	asiatisk askepraktbille	Coleoptera	HI	A2+$B_1$2+C2+D3+E3+F3+G4	K S Å
Amphibalanus amphitrite		Crustacea	HI	$B_1$3+C2+E3+G2	
Aphidoletes abietis		Diptera	HI	A4+$B_1$4+E2	S
Celtodoryx ciocalyptoides		Porifera, Cnidaria, Ctenophora	HI	A3+$B_1$2+D3+E3+G2	M
Corella eumyota		Branchiopoda, Echinodermata, Tunicata	HI	A3+$B_1$3+C2+D3+E3	M
Daphnia parvula		Crustacea	HI	A4+C2+D3+G2	
Dreissena bugensis		Mollusca	HI	A2+$B_1$2+C2+D4+E4+F4+G2+I4	M L
Elminius modestus		Crustacea	HI	$B_1$3+E3+G2	M
Halyomorpha halys		Hemiptera	HI	A4+$B_1$3+G2	K Ko Å
Hemigrapsus sanguineus		Crustacea	HI	$B_1$3+D3+E2	M
Hemigrapsus takanoi		Crustacea	HI	$B_1$3+D3+E2	M
Ips cembrae		Coleoptera	HI	A2+$B_1$2+C2+E2+G3+I3	S
Ips subelongatus		Coleoptera	HI	A2+$B_1$2+D3+G2+I3	S
Marenzelleria neglecta		Annelida	HI	A3+D3+E3+G2	M
Meloidogyne chitwoodi		Nematoda	HI	A4+$B_1$2+C3+E3+G2	Å
Meloidogyne fallax		Nematoda	HI	A4+$B_1$2+C3+E3+G2	Å
Meloidogyne minor		Nematoda	HI	A4+$B_1$2+C3+D3+E3+F3+G2+I2	Ky Å
Neogobius melanostomus		"Pisces"	HI	A4+B13+E2	M F L
Ocenebra inornata		Mollusca	HI	A2+D3	M
Palaemon macrodactylus		Crustacea	HI	A3+$B_1$4+C2+E2	M
Rana ridibunda	latterfrosk	Amphibia, Reptilia	HI	$B_1$2+D3+E2+I4	L V
Watersipora subtorquata		Bryozoa	HI	$B_1$2+D3+E3	M
Potentially high impact (PH)					
Aedes albopictus		Diptera	PH	E2+I4	S Ko
Anguilla japonica		"Pisces"	PH	D4+E2+I4	M F L
Anguilla rostrata	amerikansk ål	"Pisces"	PH	D4+E2	M F L
Anoplophora chinensis		Coleoptera	PH	D3+E4+F3	S Ko
Anoplophora glabripennis		Coleoptera	PH	E4+G2	K Å
Cameraria ohridella		Lepodoptera	PH	A3+$B_1$4	Ko
Heringia latitarsis		Diptera	PH	A4+$B_1$3	S
Micropogonias undulatus		"Pisces"	PH	A4+$B_1$4	M
Rapana venosa		Mollusca	PH	D4+E3	M
Low impact (LO)					
Acrotrichis sanctaehelenae		Coleoptera	LO	A3+$B_1$3+C2	
Anthocoris butleri		Hemiptera	LO	A2+$B_1$2	Ko
Blepharipa schineri		Diptera	LO	A2+E2	Ky S
Bothriocephalus acheilognathi		Platyhelminthes	LO	A4+E2	
Botrylloides violaceus		Branchiopoda, Echinodermata, Tunicata	LO	A3+$B_1$3+C2+E2+G2	M

Scientific name	Norwegian name	Species group	Category	Criteria*	Main habitat
Braula schmitzi		Diptera	LO	A2+$B_1$2	K Å
Bugula neritina		Bryozoa	LO	$B_1$2+E2	M
Bugula stolonifera		Bryozoa	LO	$B_1$2+E2	M
Cacoecimorpha pronubana		Lepodoptera	LO	A3	Ko
Callinectes sapidus		Crustacea	LO	D3+E2	M
Ceratophysella engadinensis		Collembola	LO	A2	
Chymomyza amoena		Diptera	LO	$B_1$4	S
Clytiomya continua		Diptera	LO	A2	K
Coenosia attenuata		Diptera	LO	A2+$B_1$2	K S
Cynaeus angustus		Coleoptera	LO	A2	Ko Å
Dasineura kellneri		Diptera	LO	A4+$B_1$2	S
Diabrotica virgifera		Coleoptera	LO	$B_1$3	Å
Dodecastichus inflatus		Coleoptera	LO	A3+$B_1$2	Ko
Dohrniphora cornuta		Diptera	LO	A4+$B_1$2+E2	K Ko
Edwardsiella lineata		Porifera, Cnidaria, Ctenophora	LO	A2+$B_1$3	M
Emys orbicularis	europeisk sumpskilpadde	Amphibia, Reptilia	LO	A3+$B_1$2	L V
Epitrix cucumeris		Coleoptera	LO	E2	K Å
Epitrix similaris		Coleoptera	LO	E2	K Å
Epitrix tuberis		Coleoptera	LO	E2	K Å
Evadne anonyx		Crustacea	LO	A3+E2	
Ficopomatus enigmaticus		Annelida	LO	A2+$B_1$2+E2	M
Gabronthus sulcifrons		Coleoptera	LO	A2+$B_1$3	K Ko Å
Glischrochilus quadrisignatus		Coleoptera	LO	A3+$B_1$3+C2+E2	S Ko
Gnathotrichus materiarius		Coleoptera	LO	A2+E2+G2	S
Hippodamia convergens		Coleoptera	LO	A3+$B_1$3	K Ko Å
Hydroides dianthus		Annelida	LO	A2+$B_1$2+E2	M
Lophocolea semiteres		Anthocerotophyta, Bryophyta, Marchantiophyta	LO	A4+$B_1$2+E2	K Ky
Micropygus vagans		Diptera	LO	A2+E2	S
Migneauxia lederi		Coleoptera	LO	A2	Ko
Nysius huttoni		Hemiptera	LO	E3+G2	
Oenopia conglobata		Coleoptera	LO	A2+$B_1$2+C2	K Ko Å
Orthodontium lineare		Anthocerotophyta, Bryophyta, Marchantiophyta	LO	A4	S
Otiorhynchus aurifer		Coleoptera	LO	A3+$B_1$3	Ko
Otiorhynchus crataegi		Coleoptera	LO	A3+$B_1$3	Ko
Otiorhynchus dieckmanni		Coleoptera	LO	A3+$B_1$2+E2	Å
Otiorhynchus salicicola		Coleoptera	LO	A3+$B_1$3	Ko
Otiorhynchus smreczynskii		Coleoptera	LO	A3+$B_1$3	Ko
Otiorhynchus tenebricosus		Coleoptera	LO	A3+$B_1$3	Ko
Ovis aries musimon	muflon	Mammalia	LO	A4+$B_1$2	
Oxycarenus lavaterae		Hemiptera	LO	E2	S Ko
Parasteatoda tepidariorum		Arachnida	LO	A3	Ko
Perophora japonica		Branchiopoda, Echinodermata, Tunicata	LO	A3+$B_1$3+E2	M
Phasia barbifrons		Diptera	LO	A3	K S
Phloeosinus rudis		Coleoptera	LO	E2	S
Phloeosinus thujae		Coleoptera	LO	E2	S
Porcellio dilatatus		Crustacea	LO	A3	Ko B
Pseudobacciger harengulae		Platyhelminthes	LO	A4+$B_1$2+C2+E2	
Quedius scintillans		Coleoptera	LO	A3+$B_1$2	K Ko Å
Resseliella conicola		Diptera	LO	A3	S
Resseliella skuhravyorum		Diptera	LO	A3	S
Rhagoletis cingulata		Diptera	LO	A2+$B_1$2+E2	S Å
Rhagoletis indifferens		Diptera	LO	A2+$B_1$2+E2	S Å
Stricticollis tobias		Coleoptera	LO	A2	Ko Å
Strobilomyia infrequens		Diptera	LO	A3+$B_1$3	S
Strobilomyia melania		Diptera	LO	A3+$B_1$2	S
Sturmia bella		Diptera	LO	A2+E2	
Tephritis praecox		Diptera	LO	A2	K Å

Scientific name	Norwegian name	Species group	Category	Criteria*	Main habitat
Tetropium gabrieli		Coleoptera	LO	C2+E2+G2	S
Thoracochaeta johnsoni		Diptera	LO	A3	F
Tricellaria inopinata		Bryozoa	LO	D3+E2	M
Trichorhina tomentosa		Crustacea	LO	A2	Ko
Urosalpinx cinerea		Mollusca	LO	D3	M
No known impact (NK)					
Acer saccharum		Magnoliophyta, Pinophyta, Pteridophyta	NK		
Ammothea hilgendorfi		Pycnogonida	NK		M
Arocatus longiceps		Hemiptera	NK		
Aronia arbutifolia		Magnoliophyta, Pinophyta, Pteridophyta	NK		
Aronia melanocarpa		Magnoliophyta, Pinophyta, Pteridophyta	NK		
Carpelimus zealandicus		Coleoptera	NK		Ky Ko
Clambus simsoni		Coleoptera	NK		Ko
Corythucha ciliata		Hemiptera	NK		
Crassostrea virginica		Mollusca	NK		M
Cryptophilus integer		Coleoptera	NK		Ko
Leptinotarsa decemlineata		Coleoptera	NK		K Ko Å
Leucocoprinus birnbaumii	gulfnokket paraplyhatt	Fungi	NK		Ko
Liriomyza huidobrensis	søramerikansk minérflue	Diptera	NK		Ko
Liriomyza sativae		Diptera	NK		
Liriomyza trifolii	floridaminérflue	Diptera	NK		Ko
Lithostygnus serripennis		Coleoptera	NK		Ko
Malus asiatica		Magnoliophyta, Pinophyta, Pteridophyta	NK		
Megaselia scalaris		Diptera	NK		S Ko
Megastigmus pinus		Hymenoptera	NK		
Monarthropalpus flavus		Diptera	NK		Ko
Orius laevigatus		Hemiptera	NK		K Ko Å
Ostrea chilensis		Mollusca	NK		M
Quadraspidiotus perniciosus		Hemiptera	NK		
Rhyzobius chrysomeloides		Coleoptera	NK		
Suillus cavipes	hulrørsopp	Fungi	NK		S Ko
Suillus placidus	elfenbenskusopp	Fungi	NK		S
Suillus viscidus	grå lerkesopp	Fungi	NK		S
Thrips palmi		Thysanoptera	NK		Ko Å
Species not impact assessed					
Agardhiella subulata		Algae			
Agrocybe rivulosa		Fungi			Ko
Anotrichium furcellatum		Algae			
Antithamnion densum		Algae			
Antithamnionella spirographidis		Algae			
Antithamnionella ternifolia		Algae			
Asparagopsis armata		Algae			
Barbatula barbatula		”Pisces”			
Cacopsylla rhododendri	rododendronsuger	Hemiptera			Ko
Carassius gibelio		”Pisces”			
Castor canadensis		Mammalia			
Chara connivens		Algae			M L
Ciboria rufofusca	edelgranbeger	Fungi			
Clathrus archeri	blekksprutsopp	Fungi			Ko
Clathrus ruber	gittersopp	Fungi			Ko
Cobitis taenia	sandsmett	”Pisces”			
Cordioniscus stebbingi		Crustacea			Ko
Corynophlaea verruculiformis		Algae			
Cryptonemia hibernica		Algae			
Cryptophilus obliteratus		Coleoptera			Ko
Culaea inconstans		”Pisces”			
Descolea antarctica	sørbøkhatt	Fungi			
Dicranopalpus ramosus		Arachnida			

Scientific name	Norwegian name	Species group	Category	Criteria*	Main habitat
Euonymus sachalinensis		Magnoliophyta, Pinophyta, Pteridophyta			
Gracilaria vermiculophylla		Algae			
Grateloupia subpectinata		Algae			
Grateloupia turuturu		Algae			
Gymnopus luxurians		Fungi			S
Hypophthalmichthys nobilis		"Pisces"			
Lactarius circellatus	gråfiolett belteriske	Fungi			
Leucoagaricus melanotrichus		Fungi			
Leucocoprinus brebissonii	svartskjellparaplyhatt	Fungi			
Leucocoprinus cepistipes	brunskjellparaplyhatt	Fungi			Ko
Leucocoprinus straminellus	blekgul paraplyhatt	Fungi			
Lomentaria hakodatensis		Algae			
Luperomorpha xanthodera		Coleoptera			Ko Å
Lysichiton camtschatcensis		Magnoliophyta, Pinophyta, Pteridophyta			
Megastigmus suspectus		Hymenoptera			
Misgurnus fossilis		"Pisces"			
Myocastor coypus	sumpbever	Mammalia			
Odiellus spinosus		Arachnida			Ko
Odocoileus virginianus		Mammalia			
Oligolophus meadii		Arachnida			
Opilio ruzickai		Arachnida			
Oxidus gracilis		Myriapoda			Ko
Panaeolus cyanescens		Fungi			Ko
Pelecus cultratus		"Pisces"			
Phloeosinus aubei		Coleoptera			S
Polyopes lancifolius		Algae			
Polysiphonia senticulosa		Algae			
Polysiphonia subtilissima		Algae			
Poratia digitata		Myriapoda			Ko
Procyon lotor	vaskebjørn	Mammalia			
Psilocybe cubensis		Fungi			Ko
Rhodeus sericeus		"Pisces"			
Sebastes schlegelii		"Pisces"			M
Silurus glanis		"Pisces"			
Solieria chordalis		Algae			
Stephanitis takeyai		Hemiptera			
Suillus amabilis		Fungi			
Suillus asiaticus		Fungi			
Suillus ochraceoroseus		Fungi			
Suillus plorans		Fungi			
Suillus tridentinus		Fungi			
Tremella simplex		Fungi			
Ulva pertusa		Algae			
Umbra pygmaea		"Pisces"			
Undaria pinnatifida		Algae			
Vimba vimba		"Pisces"			

* Criterion A and B is not independent of each other. To achieve the maximum effect category in one criterion, the second criterion must have an effect category of 3 or higher. This is shown in the overall subcategory for the invasion axis will not always be as high as the individual effect category for criterion A or B alone. E.g. the fish *Leucaspius delineatus* has an effect category 4 on criterion A, but an effect category 2 on criterion B, which gives a total subcategory 2 on the invasion axis.

Looking forward

Increased globalisation and removal of barriers inhibiting natural spread are still reasons why alien species are considered to be one of the greatest threats to biodiversity. Due to international trade and intensive travel it is very likely that new alien species will be introduced to Norway. According to the current climate scenario form the United Nations Intergovernmental Panel on Climate Change (IPCC) it is expected that climate change will increase the likelihood of alien species becoming established in Norway in the future.

Following the publication of the Norwegian Black List 2007, the Norwegian authorities have had increased focus on alien species. The problem has been discussed in several central processes, in particular in "The Norwegian strategy on alien species" released in May 2007 (Ministry of the Environment et al. 2007), and The Nature Diversity Act (Ministry of the Environment 2009) which came into force on 1st July 2009.

As part of the national strategy on alien species, 10 ministries have cooperated towards a common national target: *"The spread of organisms that do not occur naturally in ecosystems as a result of human activity shall not damage or limit ecosystem functions".* The strategy shall secure a common understanding and handling of the problem of alien species, regardless of which sector is affected or is responsible. The Nature Diversity Act includes specific paragraphs dealing with alien species, and a specific regulation on alien species will be passed soon. This regulation will probably control import and release of alien organisms and will be intended to prevent introductions which might result in unfortunate consequences for Norwegian nature. The available knowledge base which is the basis of law and regulations will be of major importance. *Alien species in Norway – with the Norwegian Black List 2012* is an important contribution to such a base.

As an element of increased focus on alien species by the authorities several action plans have been prepared outlining measures towards alien species, - many of which are now put into effect. The work on the various action plans requires a solid knowledge base such that good measures can be implemented. During the work on ecological impact assessments of alien species, knowledge gaps were identified for all species groups except mammals. Gaps are related to the alien species´ abilities to spread and become established, and the consequences these species have on native ecosystems. Relationships are complex, and this will be more apparent once a quantitative and re-examinable set of criteria are used.

A number of international conventions on conservation of biodiversity give clear

Liriomyza huidobrensis
Photo: Dag Ragnar Blystad

guidelines as to how to deal with alien species across national boundaries. The Convention on Biological Diversity (CBD) of 1992, article 8, point h) imposes the following upon countries which have ratified the convention: "Any contracting part shall prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species". Similar obligations are also included in the Bern Convention and the Ramsar Convention, in the EU's Birds and Habitats Directive, and in "European Strategy on Invasive Alien Species" (Genovesi & Shine 2003). These documents show that the challenges concerning knowledge about, and management of, alien species affect many sectors of society, and they present community challenges with relation to law, management and the need for knowledge. We are of the opinion that it is still very important to build upon one another's collective knowledge and experience, and create good arenas for cooperation between the relevant parties. This is how we may achieve the authorities' aims with respect to alien species. Here, the various parties have different roles (Gederaas et al. 2007).

The role of NBIC regarding alien species has not changed since the publication of the Norwegian Black List 2007, although our mandate is more precise following a revision in 2011. The mandate states the following: "NBIC has a responsibility for assessing the ecological impact associated with species that do not naturally belong in Norway (alien species) and to provide lists of such species which are identified in Norway".

Our role is still primarily related to ecological impact assessments. NBIC work is thus completely dependent upon production of new knowledge about alien species from research, monitoring and mapping.

The new set of criteria which has now been developed and used in the ecological impact assessments reveal a great need for new knowledge in order to be able to carry out quantitative assessments. Little has been done to systematically collect knowledge on the dynamics and distribution of alien species in Norway, something which is apparent from both the quantity and the quality of data. Therefore, a national effort is necessary to fill in the knowledge gaps.

Below are NBIC's points of view for what should be given priority by the authorities in order to improve the knowledge base for assessing the ecological impact of alien species. We emphasise that this is not a complete list of the needs for knowledge about alien species.

Knowledge requirements

Overview of what is available and what is attainable

The overview in *Alien species in Norway – with the Norwegian Black List 2012* (Appendices 1-4) is a more complete publication compared to the Norwegian Black List 2007. The species lists are compiled by the experts participating in this project, and the overview is updated and revised according to new delimitations and new knowledge. The lists of alien species should be regularly revised as such species come and go in Norway. In order to keep such lists up to date, good methods and priorities of mapping and monitoring are required. It is also important to establish and maintain good routines for reporting and documentation of observations of new alien species, by all contributors of knowledge on these species.

New recording tools have been adapted in recent years, allowing knowledge to be publicly accessible. A few reporting routines are in place, although observations still need to be documented and recorded in databases in natural history collections. In order to optimise the documentation of distribution and spread, there is a need for data from long time-series. It often takes time before an alien species displays any effect on the ecosystem it is introduced into. It may also take time before such effects are measurable, as species will have different effects at different levels of biodiversity. This is one of many reasons why impact assessments should be carried out on a regular basis.

The results of this project clearly reveal a need for better routines and recording of species which arrive together with plants and plant products. There are still many alien species which arrive in the country without being recorded or documented (Staverløkk 2006, Sæthre et al. 2010). Data from the Norwegian Food Safety Authority shows that import of nursery plants has doubled during the last 10 years, and the chances of 'door knockers' tagging along are great. Control of plant imports and plant products is regulated under the Food Act (Act relating to food production and safety etc.; Ministry of Health and Care Services 2003). Alien species which are not defined as pests on plants are not covered by the regulation on plant health of the Food Act (Forskrift om planter og tiltak mot planteskadegjørere, av 1. desember 2000) and are therefore outside any registration control. It is therefore essential that also 'door knockers' are assessed in relation to their ecological impact.

An example of how ***Reynoutria japonica*** can dominate at some sites. This species has a high invasion potential.

Photo: Lisbeth Gederaas

Photo: Lisbeth Gederaas

In many cases we have to accept that few observation data is available, either in the form of incidental data from monitoring / mapping, or as few data that have been made available in recording tools. For other species there exist many observations, but due to a reduction in the interest to collect species, such observations do not give a correct picture of a species presence in time and space. It is important that the current work with national mapping and monitoring of biodiversity ensure alien species in a satisfactory way. There is still a great uncovered need in this respect in Norway. Current methodology requires good knowledge about distribution, occurrences (localising) and changes in occupied area. This need applies in particular in use of B-criteria along the invasion axis (see chapter "Methods and set of criteria"). By covering some of these know ledge gaps, the results of the ecological impact assessments will be even more testable.

In many ways this current project has also created new knowledge – especially as it has not only focused on collating existing knowledge. An analysis of which species have a real chance of reproducing in Norway has not been previously carried out. The Nature Diversity Act makes clear demands on our duty to be cautious, it is therefore necessary to obtain information about potential future distribution and ecological impact of species. Therefore this is important knowledge for many parties which need to deal with current legislation.

Need for further development of methodology

All alien species within the species groups which are included are impact-assessed and the delimitations for species selection are discussed with the main users of this knowledge. To be able to predict the expansion of alien species into new environments is considered as one of the most difficult problems in ecology (Gilpin 1990). One needs to understand how the factors related to population increase and changes in expansion rates change in the new environment compared to within the species home range.

Impact assessments have, regardless of which method has been used, a common trait in that they must take into account several factors; impact assessments must be supported by scientific results, assumptions and criteria must be clear, uncertainties must be included, and not least should the assessments be as simple as possible (Morgan & Henrion 1990).

For several species groups the available data is not directly suitable for estimating expansion velocity (the B1-criterion) according to the model suggested in the methodology. Therefore two alternative sub-criteria were developed under criterion B, which on this occasion was used on vascular plants only. A method in which existing data, collection data and other observation data can be utilised better is important to include in the further method development. In addition, research projects on specific species / species groups should intend to collect data which is better suited to the models which are developed.

An international process should also be implemented to develop methods which can be used across national boundaries.

As there now are requests concerning the knowledge relating to intentional introductions (Ministry of the environment 2009), the current methodology is suited to assess ecological impact also for these species. Likewise, the methodology is also suited to provide the scientific documentation that is required such that trade regulations (World Trade Organisation/Sanitary and Phytosanitary measures) can control the level of protection for veterinary and phytosanitary measures.

In the future work on alien species in Norway it is necessary to make clear priorities about groups of organisms for mapping, monitoring and early warnings, likewise which habitats types that should be given priority regarding gathering of new knowledge. An overview of which pathways (vectors) are most important should also be a prioritised aim.

The contribution from NBIC

The organisational form and departmental affiliations allow NBIC to compile knowledge and to be a neutral promoter and motivator in highlighting knowledge gaps relating to alien species. This is particularly important for work on alien species, because many sectors of society have a responsibility in making decisions about management, while at the same time there are big commercial interests involved with some alien species. It is essential that the information which is promoted by NBIC both is, and is interpreted as being, independent and thus support our position.

It has always been, and will continue to be, important for NBIC to establish cooperation with the producers of knowledge, and to listen to the needs of users of such information. Society will also need updated information on alien species and their ecological impact on native biodiversity in the future. This need, which also involves how often and how ecological impact assessments ought to be carried out, should be elucidated together with the major users of such information.

By comparing the overview of alien species in Norway with the existing lists and information in DAISIE and NOBANIS (see references for internet links), the degree of completeness is not satisfactory. These overviews need to be updated continuously. NBIC can contribute to this if so is decided by the authorities.

The information on the NBIC web-site (www.biodiversity.no) is the most updated source of information on alien species in Norway, and is an important contribution in promoting knowledge about alien species. It is essential that such knowledge is maintained.

Glossary

abundance	number of individuals (e.g. per introduction event or present in a given area)
alien species	a species, subspecies, or lower taxon occurring outside of its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could not occupy without direct or indirect introduction or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce (IUCN) Synonyms: non-native, non-indigenous, foreign, exotic
anthropocentric	anthropos = human, viewed in a human perspective
anthropogenic	caused or created by humans
area of occupancy	the specific area where a species (or a habitat type) is found, here: the sum of the area of 2 x 2 km quadrates that can encircle all occurrences of the species, cf. Kålås et al. (2010)
artificial site	area which is considerably altered through human influences, as the result of intensive agriculture or other causes
bentic	species which live on, in or near the bed of an ocean or inland water, bottom-dwelling
carrying capacity (K)	the population size where density dependent factors balance the growth rate
category	see impact category
category axis	there are two aspects which are included in the impact assessments: invasion potential (category axis I) and ecological effect (category axis II)
colonised	area where an alien species is established or where it has a non-continuous, but permanent or long-term presence without reproduction (e.g. by repeated use as a staging or feeding area)

Lupinus polyphyllus
Photo: Randi Sønderland

common habitat type	habitat type (see explanation below) at major or basic habitat type level, except habitat types categorised as threatened (CR, EN, VU) on the Norwegian Red List for Ecosystems and Habitat Types 2011 (Lindgaard & Henriksen 2011) or which are rare (see explanation below)
community	organisms (of the same or different species) which occur together (at the same time) within a defined area, without consideration to any relationships (positive, neutral or negative) between these organisms (Halvorsen et al. 2009)
condition or impact ecocline	parallel, more or less gradual variation in species composition as the result of variation in condition within a habitat type (Halvorsen et al. 2009)
constructed site	habitat type (subtype of artificial site) created by human removal or considerable alterations to the original soil type, perhaps with replacement with a new soil type with new, more or less strongly, modified microhabitats
criterion	the decisive factor for which subcategory a species is placed in. Three criteria are used along the invasion axis (A, B (including B2 and B3) and C), and six categories along the effect axis (D-I). In total there are nine criteria
cryptic species	member of a group of closely related species which are difficult to distinguish by morphological characters, but which reproduce discretely from one another. Such species may be separated with the aid of (e.g.) molecular genetic methods
cryptogenic species	a species whose origin cannot be determined with certainty and therefore can be defined as alien, although it might be an indigenous species or naturally spread
demographic variation	variation in the growth rate of a population over time which is due to stochastic differences in the survival and reproductive capabilities of individuals (e.g. due to variations in mortality, clutch size, sex ratios); measured as the variance in total surviving offspring per individual
'door knockers'	alien species which are likely to spread to Norway and become established; 1) alien species in neighbouring countries being introduced via secondary introduction, 2) species which are likely to arrive in Norway via anthropogenic pathways and have species characteristics allowing them to establish and reproduce in Norway, 3) alien species which (to date) only survive and reproduce in man-made installations and habitats and has a probability of becoming established in Norwegian nature in the next 50 years
ecoclimate	here: regional ecoclines as described in "Nature Types in Norway" (NiN) (see http://www.naturtyper.artsdatabanken.no/).
ecosystem	a dynamic complex of plants, animals and microorganisms and the non-living environment around them, which through interactions comprise a functional unit (CBD 1992)
ecosystem processes	ecological processes on site, such as access to water, nutrient conversion, cultural influences and interactions between naturally occurring (native) species (Ministry of the Environment 2004)
effect	the (ecological) effect of an alien species is defined as the negative interactions (competition, predation, parasitism, indirect effects) that an alien species has on native species or change of state it might cause for habitat types. It might be expressed as the product of density and per capita effect. Positive interactions are not considered.

environmental variation	variation in population growth rate with time resulting from environmental fluctuations, which influence the survival and reproduction for all individuals in a population simultaneously
established	a species is established if at least one population reproduces naturally in the wild, and such populations is supposed to maintain; this assumes that $r \geq 0$ (see growth rate) and $K > 0$ (see carrying capacity)
estuary	a river mouth influenced by tidal water
expansion	a species' movement or spread, regardless of mechanism, vector or means of transport; expansion can include both active movement, passive movement (e.g. dispersal by animals, water or wind) and anthropogenic transport (both intentional and unintentional)
expansion velocity	the mean speed of either an actual or a assumed invasion front, measured as kilometres per year from the first documented observation or reconstruction of place of arrival and up to the invasion front, which is estimated using all observations of the given species
extent of occurrence	the total extent of the area a species is found in, defined as the area situated within the polygon formed when lines are drawn that encompass all the occurrences (a minimum convex polygon), cf. Kålås et al. (2010)
generation time	mean age of reproductive females, presented as years
growth rate	(population growth rate) increase in population size (N) over time (t); can be specified as the multiplicative rate of growth between years ($\lambda = N_{t+1} / N_t$) or as the intrinsic growth rate per capita ($r = ln\lambda$); the population is stabile when $\lambda = 1$ or $r = 0$
habitat	the living space for a species, the place or type of area where an organism or a population occurs
habitat type (cf. nature type)	homogenous type of nature which includes all plant and animal life and the environmental factors at work there, or special types of natural occurrences such as ponds, geological features and such like (Ministry of the Environment 2009). Here we use the habitat categories in Nature Types in Norway (NiN) (Halvorsen et al. 2009)
host	the organism a parasite lives on (either during part or all of its life cycle)
hybridising	the crossing of two species which results in viable offspring (hybrids); hybridising between native and alien species is a threat to native biodiversity if it leads to introgression
impact category / category	the specific impact category a species is assigned to is the sum of the subcategories for the invasion axis and the ecological effect axis. Assignment to an impact category is dependent upon where it is positioned in the category matrix. There are 5 possible impact categories: NK (no known impact), LO (low impact), PH (potentially high impact), HI (high impact) and SE (severe impact)
indigenous species	see native species
individual	what is defined as an individual is a pragmatic decision dependent upon what information is available on a particular species. For clones or colonising organisms each independent unit is considered an individual

impact	an alien species' impact is defined as the species' local ecological effect x the area which is colonised by the species
introduced species	see alien species
introgression	transmission of genetic material between species, in this instance by hybridising between a native and a an alien species with subsequent back-crossing between a hybrid and the affected native species
invasion	establishment and/or spread of an alien species
invasion potential	risk of invasion, measured as the probability to establish viable populations and the ability to expand spatially
invasive species	traditionally: a species with a large invasion potential; here: a species with a large invasion potential and large ecological effect. Both alien and native species may be invasive.
keystone species	a species which, even though it may occur in low numbers or biomass, has a major effect upon the diversity or distribution of other species. E.g. beaver, woodpeckers, top-predators
level of uncertainty	the factor employed to adjust the known occurrence of a species up to the suspected population size or suspected area of occupancy
local spread	spread of individuals from a population, where these do not have any exchange of individuals between subpopulations. An example is spread in limnic environments within a lake or water system (e.g. rivers) which are part of the same water system
locality	defined by the IUCN as a geographically or ecologically demarcated area where a single threat may rapidly affect all the individuals of a species. In some cases, this may include parts of a continuous population and in other cases several geographically separated populations
marine	pertaining to the sea
native species	A species where its presence in a given region is the result of only natural processes, with no human intervention; Delimitation in this project: species present and established in Norwegian nature before year 1800.
other habitat types	as "common habitat type". Note that during assessments of ecological effects artificial and "constructed" habitat types (cf. Nature Types in Norway, NiN) are not considered (see http://www.naturtyper.artsdatabanken.no/).
parasite	an organism which lives either in or on another living organism (host). The host receives no benefits and the relationship is harmful to the host
pathogen	disease promoting single- or multi-celled organism (parasite) or molecule (virus, prion etc.)
population size	population size is defined by IUCN as the total number of individuals capable of reproducing. For species with sexual reproduction this equals the total number of males plus total number of females. Mature specimens which will never reproduce are excluded, cf. Kålås et al. (2010)
preadapted	character which has originally evolved as an evolutionary response to previous selection pressure, and which later has the potential to be included in another biological role
predation	when a species (predator) survives by eating other organisms (prey)

prevalence	here: degree of parasitism, i.e. the proportion of a host population infected by a given parasite
problem species	a species causing negative changes to habitat types, reduction in native species, or is a host for new or increasing diseases. Changes may be the result of human influences. Problem species may be alien or native
qualitative assessment	a logical discussion of relevant factors of a type of impact where the probability of introduction, spread and effect are not expressed numerically, but by use of general categories
quantitative assessment	a grading of impact using numerical values and probability of an event to occur, possibly also distributed across magnitudes of impact, or intervals of probability and effect
rare habitat type	a habitat type evaluated to be near threatened (category NT) based upon the criterion concerning small area of occupancy (Lindgaard & Henriksen 2011)
red list species	species that are classified on the Norwegian Red List for Species in one of the 6 categories: RE (regionally extinct), CR (critically threatened), EN (endangered), VU (vulnerable), NT (near threatened) or DD (data deficient), (cf. Kålås et al. 2010)
regional spread	the spread of individuals between meta populations
reproduction strategy	the way in which a species allocates resources to produce offspring. (Here e.g. sexual / asexual reproduction, K-/r- selected strategy).
risk	the consequences of an event multiplied by the probability of the event. The event may be that an alien species spreads or has negative effects upon native species and habitat types
secondary introduction	the activity where alien species spread by self-dispersal from wild populations in areas bordering Norway
subcategory	the category given for each axis (which is the result for the given criteria) (4 possible subcategories per axis). The impact category that a species is assigned to is a combination of the subcategories along the two axes – invasion axis and ecological effect axis
subpopulation	population which is isolated so that there is little demographic or genetic exchange (< 1 successful migrant or gamete per year)
threatened habitat type	habitat types evaluated to the categories CR (critically threatened), EN (endangered) or VU (vulnerable) on the Norwegian Red List for Ecosystems and Habitat Types 2011 (Lindgaard and Henriksen 2011)
threatened species	species (or subspecies) evaluated to the categories CR (critically threatened), EN (endangered) or VU (vulnerable) on the Norwegian Red List for Species 2010 (Kålås et al. 2010)
time delimitation	here: 1) in a future perspective a consideration of the longest period among 50 years or 5 generations for a species, 2) in a historically perspective species are considered alien if they became established and started reproducing in the wild after 1800
time lag	here: time before an alien species begins to expand in its new environment

trophic interactions	interactions between organisms at different trophic levels, e.g. between consumers and producers in an ecosystem
trophic level	step in a food chain. (Plants constitute the lowest trophic level in all food chains (1st level). Organisms which live on plants – from bacteria and fungi to humans and whales – are placed higher up on the scale. Trophic level 2 comprises organisms which are mainly plant consumers and feed on phyto-plankton. Organisms at level 2 which in turn are eaten by large animals (large zooplankton, fish etc.) belong to trophic level 3).
vector	1) in the broadest sense: pathway in which an alien species is being intro-duced to new areas; 2) any factor (dispersal agent) which leads to introduction or spread of an alien species; For parasites: a species which transmits parasites to other species (see host)
viable offspring	fertile offspring which survive to reproductive age
zoonose	parasite / disease which may be transmitted from animals to humans (either directly or via an intermediate host)

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Arion vulgaris
Photo: Torkild Bakken

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Species index

Branta canadensis
Photo: Per Jordhøy

Appendices

Sargassum muticum
Photo: Jan Rueness

Appendix 1

Appendix 1 is a list of alien species in Norway which at the current time reproduce, or have the potential to reproduce in Norwegian nature within the next 50 years. The list is arranged first by species group, and thereafter alphabetically by species name. Species from mainland Norway and Norwegian territorial waters are listed first, followed by species from Svalbard. All the species in this list have been impact-assessed.

Species group	Scientific name	Expert group
Norway and the Norwegian territorial waters		
Algae	*Aglaothamnion halliae*	Algae
Algae	*Antithamnion nipponicum*	Algae
Algae	*Bonnemaisonia hamifera*	Algae
Algae	*Codium fragile*	Algae
Algae	*Colpomenia peregrina*	Algae
Algae	*Dasya baillouviana*	Algae
Algae	*Heterosiphonia japonica*	Algae
Algae	*Neosiphonia harveyi*	Algae
Algae	*Sargassum muticum*	Algae
Amphibia, Reptilia	*Rana* kl. *esculenta*	Amphibians and Reptiles
Amphibia, Reptilia	*Rana lessonae*	Amphibians and Reptiles
Branchiopoda, Echinodermata, Tunicata	*Molgula manhattensis*	Marine invertebrates
Branchiopoda, Echinodermata, Tunicata	*Styela clava*	Marine invertebrates
Coleoptera	*Acrotona parens*	Terrestrial and Limnic Invertebrates
Coleoptera	*Acrotona pseudotenera*	Terrestrial and Limnic Invertebrates
Coleoptera	*Acrotrichis cognata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Acrotrichis henrici*	Terrestrial and Limnic Invertebrates
Coleoptera	*Acrotrichis insularis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Adistemia watsoni*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ahasverus advena*	Terrestrial and Limnic Invertebrates
Coleoptera	*Alphitobius diaperinus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Alphitophagus bifasciatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Anthrenus verbasci*	Terrestrial and Limnic Invertebrates
Coleoptera	*Atomaria lewisi*	Terrestrial and Limnic Invertebrates
Coleoptera	*Attagenus smirnovi*	Terrestrial and Limnic Invertebrates
Coleoptera	*Baeocrara japonica*	Terrestrial and Limnic Invertebrates
Coleoptera	*Barypeithes mollicomus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Bisnius parcus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Bohemiellina flavipennis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Bostrichus capucinus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Caenoscelis subdeplanata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Carcinops pumilio*	Terrestrial and Limnic Invertebrates
Coleoptera	*Carpophilus hemipterus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Carpophilus marginellus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cartodere bifasciata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cartodere constricta*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cartodere nodifer*	Terrestrial and Limnic Invertebrates
Coleoptera	*Coproporus immigrans*	Terrestrial and Limnic Invertebrates
Coleoptera	*Corticaria elongata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptolaemus montrouzieri*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptophagus acutangulus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptophagus cellaris*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptophagus subfumatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptopleurum subtile*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dalotia coriaria*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dermestes haemorrhoidalis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dermestes peruvianus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dinoderus minutus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Epitrix pubescens*	Terrestrial and Limnic Invertebrates
Coleoptera	*Euophryum confine*	Terrestrial and Limnic Invertebrates
Coleoptera	*Gabronthus thermarum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Harmonia axyridis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Harpalus signaticornis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Henoticus californicus*	Terrestrial and Limnic Invertebrates

Species group	Scientific name	Expert group
Coleoptera	*Heterothops stiglundbergi*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ips amitinus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Lilioceris lilii*	Terrestrial and Limnic Invertebrates
Coleoptera	*Lithocharis nigriceps*	Terrestrial and Limnic Invertebrates
Coleoptera	*Meligethes maurus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Mesocolopus collaris*	Terrestrial and Limnic Invertebrates
Coleoptera	*Monochamus alternatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Myrmecocephalus concinnus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Necrobia violacea*	Terrestrial and Limnic Invertebrates
Coleoptera	*Niptus hololeucus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Oligota parva*	Terrestrial and Limnic Invertebrates
Coleoptera	*Omalium rugatum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Omonadus floralis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Oryctes nasicornis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Otiorhynchus armadillo*	Terrestrial and Limnic Invertebrates
Coleoptera	*Oxytelus migrator*	Terrestrial and Limnic Invertebrates
Coleoptera	*Perigona nigriceps*	Terrestrial and Limnic Invertebrates
Coleoptera	*Philonthus rectangulus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Phyllobius intrusus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Phyllodrepa puberula*	Terrestrial and Limnic Invertebrates
Coleoptera	*Porotachys bisulcatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ptinella johnsoni*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ptinus fur*	Terrestrial and Limnic Invertebrates
Coleoptera	*Reesa vespulae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Sinoxylon anale*	Terrestrial and Limnic Invertebrates
Coleoptera	*Thecturota marchii*	Terrestrial and Limnic Invertebrates
Coleoptera	*Trichiusa immigrata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Typhaea haagi*	Terrestrial and Limnic Invertebrates
Mollusca	*Arion rufus*	Terrestrial and Limnic Invertebrates
Mollusca	*Arion vulgaris*	Terrestrial and Limnic Invertebrates
Mollusca	*Bithynia tentaculata*	Terrestrial and Limnic Invertebrates
Mollusca	*Boettgerilla pallens*	Terrestrial and Limnic Invertebrates
Mollusca	*Cornu aspersum*	Terrestrial and Limnic Invertebrates
Mollusca	*Crassostrea gigas*	Marine invertebrates
Mollusca	*Crepidula fornicata*	Marine invertebrates
Mollusca	*Deroceras panormitanum*	Terrestrial and Limnic Invertebrates
Mollusca	*Ensis directus*	Marine invertebrates
Mollusca	*Helicella itala*	Terrestrial and Limnic Invertebrates
Mollusca	*Helix pomatia*	Terrestrial and Limnic Invertebrates
Mollusca	*Limax maximus*	Terrestrial and Limnic Invertebrates
Mollusca	*Oxychilus draparnaudi*	Terrestrial and Limnic Invertebrates
Mollusca	*Petricolaria pholadiformis*	Marine invertebrates
Mollusca	*Planorbarius corneus*	Terrestrial and Limnic Invertebrates
Mollusca	*Planorbis carinatus*	Terrestrial and Limnic Invertebrates
Mollusca	*Potamopyrgus antipodarum*	Marine invertebrates
Mollusca	*Viviparus viviparus*	Terrestrial and Limnic Invertebrates
Mollusca	*Xerolenta obvia*	Terrestrial and Limnic Invertebrates
Mollusca	*Zonitoides arboreus*	Terrestrial and Limnic Invertebrates
Arachnida	*Argiope bruennichi*	Terrestrial and Limnic Invertebrates
Arachnida	*Lathys humilis*	Terrestrial and Limnic Invertebrates
Arachnida	*Mitostoma chrysomelas*	Terrestrial and Limnic Invertebrates
Arachnida	*Opilio canestrinii*	Terrestrial and Limnic Invertebrates
Arachnida	*Ostearius melanopygius*	Terrestrial and Limnic Invertebrates
Arachnida	*Pholcus phalangioides*	Terrestrial and Limnic Invertebrates
Arachnida	*Psilochorus simoni*	Terrestrial and Limnic Invertebrates
Arachnida	*Tegenaria atrica*	Terrestrial and Limnic Invertebrates
Arachnida	*Tegenaria domestica*	Terrestrial and Limnic Invertebrates
"Pisces"	*Ameiurus nebulosus*	Fish
"Pisces"	*Carassius auratus*	Fish
"Pisces"	*Gobio gobio*	Fish
"Pisces"	*Lepomis gibbosus*	Fish
"Pisces"	*Leucaspius delineatus*	Fish
"Pisces"	*Oncorhynchus gorbuscha*	Fish

Species group	Scientific name	Expert group
"Pisces"	*Oncorhynchus mykiss*	Fish
"Pisces"	*Salvelinus fontinalis*	Fish
"Pisces"	*Salvelinus namaycush*	Fish
"Pisces"	*Tinca tinca*	Fish
Platyhelminthes	*Gyrodactylus salaris*	Roundworms and Flatworms
Platyhelminthes	Onchocleidus similis	Roundworms and Flatworms
Platyhelminthes	*Onchocleidus sp.*	Roundworms and Flatworms
Platyhelminthes	*Pseudodactylogyrus anguillae*	Roundworms and Flatworms
Platyhelminthes	*Pseudodactylogyrus bini*	Roundworms and Flatworms
Aves	*Aix galericulata*	Birds
Aves	*Aix sponsa*	Birds
Aves	*Alectoris chukar*	Birds
Aves	*Alopochen aegyptiaca*	Birds
Aves	*Anas cyanoptera*	Birds
Aves	*Anas erythrorhyncha*	Birds
Aves	*Anas formosa*	Birds
Aves	*Anas sibilatrix*	Birds
Aves	*Anser caerulescens*	Birds
Aves	*Anser canagicus*	Birds
Aves	*Anser indicus*	Birds
Aves	*Anser rossii*	Birds
Aves	*Branta canadensis*	Birds
Aves	*Branta hutchinsii*	Birds
Aves	*Buteo swainsonii*	Birds
Aves	*Cairina moschata*	Birds
Aves	*Cygnus atratus*	Birds
Aves	*Falco cherrug*	Birds
Aves	*Lophodytes cucullatus*	Birds
Aves	*Oxyura jamaicensis*	Birds
Aves	*Phasianus colchicus*	Birds
Magnoliophyta, Pinophyta, Pteridophyta	*Abies alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies balsamea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies concolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies grandis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies koreana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies lasiocarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies mariesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies procera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abies sibirica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer campestre*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer ginnala*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer negundo*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer pseudoplatanus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer tataricum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Achillea nobilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aconitum ×stoerkianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aconitum napellus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aconogonon ×fennicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aconogonon alpinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aconogonon divaricatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aconogonon weyrichii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aesculus hippocastanum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aethusa cynapium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ajuga genevensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alcea rosea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alchemilla heptagona*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alchemilla mollis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alchemilla semilunaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium ×hollandicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium angulosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium carinatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium schoenoprasum schoenoprasum*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Allium scorodoprasum rotundum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium victorialis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alnus viridis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alyssum alyssoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus blitoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus hybridus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus retroflexus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ambrosia artemisiifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ambrosia psilostachya*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amelanchier alnifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amelanchier lamarckii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amelanchier ovalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amelanchier spicata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amsinckia micrantha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anaphalis margaritacea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anchusa azurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Androsace elongata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anemone apennina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anemone blanda*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anemone sylvestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anemonidium canadense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthemis cotula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthemis ruthenica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthriscus cerefolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthyllis vulneraria carpatica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Antirrhinum majus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aphanes arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arabidopsis arenosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arabidopsis halleri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arabidopsis suecica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arabis caucasica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aralia racemosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arctium tomentosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aremonia agrimonioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aristolochia clematitis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Armoracia rusticana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aronia ×prunifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia abrotanum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia pontica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia siversiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia stelleriana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arum maculatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aruncus dioicus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Asarum canadense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Asparagus officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aster alpinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aster amellus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Astilbe ×arendsii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Astrantia major*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Atropa belladonna*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aurinia saxatilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena strigosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ballota nigra nigra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Balsamita major*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Barbarea vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Beckmannia syzigachne*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Berberis aggregata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Berberis thunbergii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bergenia cordifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bergenia crassifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Berteroa incana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Betonica macrantha*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Betonica officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bistorta officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Borago officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica adpressa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica elongata integrifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica juncea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica napus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica nigra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica oleracea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica rapa oleifera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica rapa rapa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromopsis erecta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromopsis inermis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromopsis pubescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus commutatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brunnera macrophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bryonia alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Buddleja davidii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bunias orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Buxus sempervirens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Calendula arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Calendula officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Calystegia sepium spectabilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Camelina alyssum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Camelina microcarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Camelina sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	Campanula glomerata glomerata	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula glomerata Superba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula latifolia macrantha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula patula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula rapunculoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Capnoides sempervirens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Caragana arborescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Caragana frutex*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cardamine parviflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carduus acanthoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carduus nutans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carduus thoermeri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carex pendula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carex praecox*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carex strigosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carlina acaulis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carpinus betulus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Castanea sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Celastrus orbicularis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea dealbata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea montana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea nigra nemoralis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea stoebe*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea triumfettii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cephalaria gigantea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cerastium tomentosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cercidiphyllum japonicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaenomeles japonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaenorhinum minus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaerophyllum aromaticum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaerophyllum aureum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaerophyllum bulbosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaerophyllum prescottii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaerophyllum temulum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecyparis lawsoniana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecyparis nootkatensis*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecytisus ×versicolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecytisus glaber*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaespartium sagittale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chelone glabra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium ficifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium hybridum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium murale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium polyspermum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium rubrum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cicerbita macrophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cicerbita plumieri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cirsium dissectum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Claytonia perfoliata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Claytonia sibirica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clematis alpina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clematis recta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clematis tangutica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clematis vitalba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clematis viticella*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coincya monensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Colchicum autumnale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Commelina communis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Conium maculatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Conyza canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coreopsis grandiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coriandrum sativum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coronopus didymus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coronopus squamatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corydalis angustifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corydalis bracteata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corydalis nobilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corydalis solida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corydalis wendelboi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster ascendens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster bullatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster dammeri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster dielsianus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster divaricatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster foveolatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster hjelmqvistii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster horizontalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster ignescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster laetevirens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster latifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster lucidus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster moupinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster multiflorus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster nanshan*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster salicifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster simonsii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster tomentosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster villosulus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotula coronopifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crataegus laevigata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crataegus macracantha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crataegus sanguinea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crepis biennis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crepis capillaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crepis setosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crocus ×stellaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crocus chrysanthus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crocus flavus*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Crocus speciosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crocus tommasinianus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crocus vernus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cuscuta epithymum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cymbalaria muralis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dasiphora fruticosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Daucus carota carota*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Delphinium ×cultorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Delphinium elatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dianthus barbatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dianthus plumarius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dicentra formosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Diervilla florida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Digitalis lanata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Digitalis lutea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Digitaria ischaemum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Diplotaxis muralis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Diplotaxis tenuifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dipsacus fullonum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dipsacus strigosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Doronicum ×excelsum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Doronicum columnae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Doronicum macrophyllum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Doronicum pardalianches*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Doronicum plantagineum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Draba nemorosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dracocephalum parviflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dracocephalum sibiricum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dracocephalum thymiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Duchesnea indica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinochloa crus-galli*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinops bannaticus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinops exaltatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinops sphaerocephalus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echium vulgare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elaeagnus commutata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elodea canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elodea nuttallii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epilobium brunnescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epilobium ciliatum ciliatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epilobium ciliatum glandulosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epilobium hirsutum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epilobium tetragonum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epimedium alpinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epimedium pinnatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eranthis hyemalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erigeron annuus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erucastrum gallicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eryngium alpinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eryngium giganteum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eryngium planum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erythronium dens-canis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euonymus europaeus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euonymus latifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euonymus nanus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eupatorium purpureum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia amygdaloides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia chamaesyce*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia cyparissias*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia dulcis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia epithymoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia esula*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia lathyris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia peplus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Festuca gautieri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Festuca heterophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Festuca ovina capillata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Festuca rubra commutata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Festuca rubra megastachys*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Filipendula kamtschatica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Filipendula purpurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Filipendula rubra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fragaria ×ananassa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fragaria chiloënsis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fragaria moschata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fragaria virginiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fritillaria meleagris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fumaria vaillantii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gagea minima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gagea pratensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gaillardia ×grandiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galanthus elwesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galanthus nivalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galega officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galega orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galeopsis pubescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galinsoga parviflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galinsoga quadriradiata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium mollugo mollugo*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium pumilum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium pycnotrichum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium rivale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium rotundifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gamochaeta purpurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Genista tinctoria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium endressii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium macrorrhizum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium nodosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium palustre*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium phaeum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium pylzowianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium pyrenaicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium sibiricum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geum aleppicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geum macrophyllum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geum quellyon*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Glyceria grandis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Glyceria maxima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gypsophila muralis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gypsophila repens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Halerpestes cymbalaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus ×laetiflorus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus rigidus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus tuberosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hemerocallis lilioasphodelus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Heracleum mantegazzianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Heracleum persicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Herniaria glabra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hesperis matronalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hesperis tristis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Heuchera sanguinea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Holodiscus discolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum jubatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hottonia palustris*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Hyacinthoides hispanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hyacinthoides italica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hyacinthoides non-scripta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hydrangea macrophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hydrangea petiolaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hydrophyllum virginianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hylotelephium anacampseros*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hylotelephium ewersii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hylotelephium ruprechtii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hylotelephium telephium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iberis amara*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iberis sempervirens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iberis umbellata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Impatiens cristata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Impatiens glandulifera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Impatiens parviflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Inula britannica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Inula helenium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iris ×germanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iris chrysographes*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iris pumila*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iris sibirica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iris versicolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Juglans regia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Juncus ensifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Juncus tenuis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Kalmia angustifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Koeleria pyramidata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Kolkwitzia amabilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Laburnum ×watereri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Laburnum alpinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Laburnum anagyroides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lactuca serriola*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lamiastrum galeobdolon argentatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lamiastrum galeobdolon galeobdolon*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lamium amplexicaule orientale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lamium maculatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lamprocapnos spectabilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Larix ×marschlinsii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Larix decidua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Larix kaempferi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Larix sibirica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus latifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus tuberosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Leonurus cardiaca villosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium campestre*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium cordatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium densiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium draba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium heterophyllum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium latifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium neglectum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium ruderale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium sativum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidotheca suaveolens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Leucanthemum ×superbum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Leucojum vernum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Levisticum officinale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ligularia dentata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ligularia przewalskii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ligularia sibirica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ligularia stenocephala*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Ligustrum ovalifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lilium bulbiferum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lilium candidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lilium lancifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lilium martagon*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lilium pensylvanicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linaria repens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linum perenne*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lobularia maritima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lolium multiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera alpigena*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera caerulea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera caprifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera involucrata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera japonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera korolkowii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera morrowii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera nigra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera sempervirens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera tatarica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lotus corniculatus sativus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lotus glaber*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lotus pedunculatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lotus subbiflorus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lunaria annua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus nootkatensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus perennis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus polyphyllus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Luzula forsteri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Luzula luzuloides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Luzula nivea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lychnis chalcedonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lychnis coronaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lycium barbarum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lysichiton americanus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lysimachia ciliata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lysimachia nummularia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lysimachia punctata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lythrum virgatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mahonia aquifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Maianthemum racemosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Maianthemum stellatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus ×domestica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus baccata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus floribunda*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus pumila*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus sargentii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus sieboldii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malva alcea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malva moschata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malva verticillata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Meconopsis cambrica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago sativa ×varia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago sativa falcata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago sativa sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melampyrum nemorosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melica altissima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melica ciliata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus albus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus altissimus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha ×gracilis*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha ×piperita*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha ×rotundifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha ×smithiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha ×villosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha longifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha spicata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mercurialis annua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mimulus guttatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mimulus luteus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Muscari armeniacum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Muscari botryoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Myosotis alpestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Myosotis sparsiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Myosotis sylvatica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Myrrhis odorata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Narcissus poëticus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Narcissus pseudonarcissus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nasturtium officinale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nepeta cataria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nepeta grandiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Neslia paniculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nicandra physalodes*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Noccaea caerulescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nonea versicolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nymphoides peltata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Odontites vernus serotinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera biennis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera canovirens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera casimiri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera depressa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera muricata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera rubricauloides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera scandinavica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Omphalodes verna*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ononis spinosa spinosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ornithogalum angustifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ornithogalum nutans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ornithopus compressus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ornithopus sativus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Orobanche caryophyllacea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Orobanche elatior*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Orobanche hederae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Orobanche lucorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Othocallis siberica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oxalis corniculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oxalis dillenii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oxalis stricta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver alpinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver atlanticum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver bracteatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver croceum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver dubium dubium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver pseudoorientale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver rhoeas*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Parasenecio hastatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Parietaria pensylvanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Parthenocissus inserta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pastinaca sativa hortensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pastinaca sativa sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pentaglottis sempervirens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Persicaria wallichii*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Petasites hybridus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Petasites japonicus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Petroselinum crispum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phacelia tanacetifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phedimus aizoon*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phedimus hybridus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phedimus kamtschaticus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phedimus spurius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phedimus stoloniferus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Philadelphus coronarius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Philadelphus lewisii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phlox paniculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phlox subulata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physalis alkekengi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physocarpus opulifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phyteuma nigrum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phyteuma spicatum caeruleum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picea ×lutzii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picea engelmannii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picea glauca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picea omorika*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picea pungens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picea sitchensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picris hieracioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pieris japonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pimpinella major*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus cembra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus contorta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus mugo mugo*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus mugo uncinata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus nigra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus peuce*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus sibirica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pinus strobus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Plantago* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Poa chaixii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Poa supina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polemonium reptans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus ×berolinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus ×canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus ×canescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus balsamifera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus laurifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus nigra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus simonii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Populus trichocarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Portulaca oleracea oleracea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla anglica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla inclinata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla intermedia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla norvegica hirsuta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla recta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla reptans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla thuringiaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prenanthes purpurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Primula elatior*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus cerasifera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus cerasus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus domestica insititia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus mahaleb*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus serotina*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus virginiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pseudofumaria lutea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pseudotsuga menziesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulmonaria affinis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulmonaria mollis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulmonaria officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulmonaria rubra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulmonaria saccharata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulsatilla vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Puschkinia scilloides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pyrus ×communis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Quercus cerris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Quercus rubra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus aconitifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus acris friesianus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus lanuginosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus serpens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Reseda lutea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Reseda luteola*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Reynoutria ×bohemica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Reynoutria japonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Reynoutria sachalinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rheum ×rhabarbarum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rhododendron brachycarpum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rhododendron sutchuenense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rhus typhina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ribes ×pallidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ribes divaricatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ribes odoratum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ribes rubrum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ribes sanguineum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ribes uva-crispa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Robinia pseudacacia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rodgersia podophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rorippa ×armoracioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rorippa austriaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa acicularis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa carolina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa davurica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa glauca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa 'Hollandica'*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa nitida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa pendulina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa rugosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus allegheniensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus armeniacus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus bifrons*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus dasyphyllus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus echinatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus euryanthemus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus glandulosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus hartmanii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus laciniatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus leptothyrsus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus odoratus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus parviflorus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus pedemontanus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus pyramidalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus rudis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus sciocharis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus spectabilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus sylvaticus*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus tuberculatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rudbeckia hirta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rudbeckia laciniata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex confertus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex patientia patientia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex pseudoalpinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex rugosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×alopecuroides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×dasyclados*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×fragilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×meyeriana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×mollissima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×rubra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×sepulcralis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×smithiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix acutifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix alaxensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix euxina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix purpurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix viminalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salvia nemorosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salvia pratensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salvia verticillata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sambucus nigra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sambucus pubens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sambucus racemosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sanguisorba canadensis canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sanguisorba canadensis latifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sanguisorba minor balearica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sanguisorba minor minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saponaria ocymoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saponaria officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga ×arendsii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga ×geum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga ×urbium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga rotundifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga umbrosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scilla forbesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scilla luciliae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scilla sardensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scleranthus annuus annuus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scopolia carniolica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scrophularia chrysantha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scutellaria altissima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Securigera varia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sedum forsterianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sedum hispanicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sedum lydium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sedum sexangulare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sempervivum tectorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio cordatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio erucifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio inaequidens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio ovatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio pseudoarnica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio squalidus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio subalpinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio vernalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio viscosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sibbaldianthe bifurca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene csereii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene gallica*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Sinacalia tangutica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium altissimum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium loeselii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium orientale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium strictissimum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisyrinchium montanum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum americanum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum nigrum schultesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum physalifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solidago canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solidago gigantea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbaria sorbifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbus austriaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbus commixta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbus intermedia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbus koehneana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbus latifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbus mougeotii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spergularia rubra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×arguta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×billardii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×bumalda*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×cinerea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×macrothyrsa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×pseudosalicifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×rosalba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×rubella*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea ×vanhouttei*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea chamaedryfolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea douglasii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea japonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea latifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea media*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea salicifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea tomentosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea trilobata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stachys annua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stachys arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stachys germanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stratiotes aloides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Swida alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Swida sericea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphoricarpos albus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphoricarpos orbiculatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum ×salignum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum ×versicolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum cordifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum lanceolatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum novae-angliae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum novi-belgii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphytum ×uplandicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphytum asperum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphytum officinale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Syringa josikaea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Syringa vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tanacetum coccineum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tanacetum macrophyllum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tanacetum parthenium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Telekia speciosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tellima grandiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tephroseris palustris*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Thalictrum aquilegifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thalictrum delavayi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thalictrum minus minus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thuja occidentalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thuja plicata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thymus praecox praecox*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tiarella cordifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium pannonicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium spadiceum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tripterygium regelii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trisetum flavescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tsuga canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tsuga heterophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tulipa sylvestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tulipa tarda*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Turritis brassica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ulex europaeus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ulmus laevis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ulmus minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veratrum album*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum lychnitis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum olympicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica austriaca austriaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica austriaca teucrium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica filiformis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica gentianoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica hederifolia hederifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica hederifolia lucorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica opaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica peregrina peregrina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica persica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica polita*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Viburnum lantana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia sativa segetalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia tenuifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia villosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vinca minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vincetoxicum rossicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Viola ×wittrockiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Viola cornuta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Viola odorata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Viola suavis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vulpia myuros*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Waldsteinia geoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Waldsteinia ternata*	Vascular plants
Crustacea	*Acartia tonsa*	Marine invertebrates
Crustacea	*Amphibalanus improvisus*	Marine invertebrates
Crustacea	*Androniscus dentiger*	Terrestrial and Limnic Invertebrates
Crustacea	*Armadillidium nasatum*	Terrestrial and Limnic Invertebrates
Crustacea	*Caprella mutica*	Marine invertebrates
Crustacea	*Chionoecetes opilio*	Marine invertebrates
Crustacea	*Daphnia ambigua*	Terrestrial and Limnic Invertebrates
Crustacea	*Eriocheir sinensis*	Terrestrial and Limnic Invertebrates
Crustacea	*Homarus americanus*	Marine invertebrates
Crustacea	*Ischyrocerus commensalis*	Marine invertebrates
Crustacea	*Pacifastacus leniusculus*	Terrestrial and Limnic Invertebrates
Crustacea	*Paralithodes camtschatica*	Marine invertebrates
Crustacea	*Porcellionides pruinosus*	Terrestrial and Limnic Invertebrates
Crustacea	*Trichoniscoides sarsi*	Terrestrial and Limnic Invertebrates
Annelida	*Goniadella gracilis*	Marine invertebrates
Annelida	*Marenzelleria viridis*	Marine invertebrates

Species group	Scientific name	Expert group
Myriapoda	*Cryptops parisi*	Terrestrial and Limnic Invertebrates
Myriapoda	*Cylindroiulus truncorum*	Terrestrial and Limnic Invertebrates
Myriapoda	*Kryphioiulus occultus*	Terrestrial and Limnic Invertebrates
Myriapoda	*Stigmatogaster subterraneus*	Terrestrial and Limnic Invertebrates
Anthocerotophyta, Bryophyta, Marchantiophyta	*Campylopus introflexus*	Mosses
Anthocerotophyta, Bryophyta, Marchantiophyta	*Ricciocarpos natans*	Mosses
Hemiptera	*Aphrastasia pectinatae*	Terrestrial and Limnic Invertebrates
Hemiptera	*Atractotomus parvulus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Bemisia tabaci*	Terrestrial and Limnic Invertebrates
Hemiptera	*Deraeocoris lutescens*	Terrestrial and Limnic Invertebrates
Hemiptera	*Eriosoma lanigerum*	Terrestrial and Limnic Invertebrates
Hemiptera	*Heterogaster urticae*	Terrestrial and Limnic Invertebrates
Hemiptera	*Illinoia lambersi*	Terrestrial and Limnic Invertebrates
Hemiptera	*Kybos abstrusus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Lepidosaphes newsteadi*	Terrestrial and Limnic Invertebrates
Hemiptera	*Leptoglossus occidentalis*	Terrestrial and Limnic Invertebrates
Hemiptera	*Lyctocoris campestris*	Terrestrial and Limnic Invertebrates
Hemiptera	*Macrolophus melanotoma*	Terrestrial and Limnic Invertebrates
Hemiptera	*Macropsis graminea*	Terrestrial and Limnic Invertebrates
Hemiptera	*Macrosiphoniella sanborni*	Terrestrial and Limnic Invertebrates
Hemiptera	*Macrosiphum euphorbiae*	Terrestrial and Limnic Invertebrates
Hemiptera	*Myzus ascalonicus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Nezara viridula*	Terrestrial and Limnic Invertebrates
Hemiptera	*Opsius stactogalus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Orius insidiosus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Parthenolecanium pomeranicum*	Terrestrial and Limnic Invertebrates
Hemiptera	*Piezodorus lituratus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Populicerus nitidissimus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Psylla buxi*	Terrestrial and Limnic Invertebrates
Hemiptera	*Rhytidodus decimusquartus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Stenidiocerus poecilus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Tremulicerus fulgidus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Trioza apicalis*	Terrestrial and Limnic Invertebrates
Mammalia	*Dama dama*	Mammals
Mammalia	*Lepus europaeus*	Mammals
Mammalia	*Micromys minutus*	Mammals
Mammalia	*Neovison vison*	Mammals
Mammalia	*Nyctereutes procyonoides*	Mammals
Mammalia	*Ondatra zibethicus*	Mammals
Mammalia	*Oryctolagus cuniculus*	Mammals
Mammalia	*Ovibos moschatus*	Mammals
Mammalia	*Sus scrofa*	Mammals
Orthoptera, Blattodea, Dermaptera	*Acheta domestica*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Gryllotalpa gryllotalpa*	Terrestrial and Limnic Invertebrates
Nematoda	*Anguillicoloides crassus*	Roundworms and Flatworms
Nematoda	*Camelostrongylus mentulatus*	Roundworms and Flatworms
Nematoda	*Globodera pallida*	Roundworms and Flatworms
Nematoda	*Globodera rostochiensis*	Roundworms and Flatworms
Nematoda	*Meloidogyne hapla*	Roundworms and Flatworms
Nematoda	*Meloidogyne naasi*	Roundworms and Flatworms
Nematoda	*Nematodirus battus*	Roundworms and Flatworms
Nematoda	*Strongyloides stercoralis*	Roundworms and Flatworms
Lepidoptera	*Argyresthia fundella*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Argyresthia trifasciata*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Epinotia fraternana*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Epinotia nigricana*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Epinotia subsequana*	Terrestrial and Limnic Invertebrates
Fungi	*Agaricus bisporus*	Fungi
Fungi	*Agaricus bitorquis*	Fungi
Fungi	*Agaricus moelleri*	Fungi
Fungi	*Agaricus subperonatus*	Fungi
Fungi	*Agaricus xanthodermus*	Fungi

Species group	Scientific name	Expert group
Fungi	*Agrocybe cylindrica*	Fungi
Fungi	*Agrocybe tabacina*	Fungi
Fungi	*Albatrellus syringae*	Fungi
Fungi	*Chlorophyllum brunneum*	Fungi
Fungi	*Coleosporium tussilaginis*	Fungi
Fungi	*Cronartium ribicola*	Fungi
Fungi	*Cyathus stercoreus*	Fungi
Fungi	*Delphinella abietis*	Fungi
Fungi	*Didymascella thujina*	Fungi
Fungi	*Erysiphe alphitoides*	Fungi
Fungi	*Erysiphe divaricata*	Fungi
Fungi	*Erysiphe flexuosa*	Fungi
Fungi	*Erysiphe friesii*	Fungi
Fungi	*Erysiphe hypophylla*	Fungi
Fungi	*Erysiphe palczewskii*	Fungi
Fungi	*Erysiphe syringae-japonicae*	Fungi
Fungi	*Erysiphe vanbruntiana*	Fungi
Fungi	*Erysiphe viburnicola*	Fungi
Fungi	*Fibrodontia gossypina*	Fungi
Fungi	*Glomerella acutata*	Fungi
Fungi	*Gomphidius maculatus*	Fungi
Fungi	*Guignardia aesculi*	Fungi
Fungi	*Gyromitra sphaerospora*	Fungi
Fungi	*Hymenoscyphus pseudoalbidus*	Fungi
Fungi	*Lachnellula calyciformis*	Fungi
Fungi	*Lachnellula occidentalis*	Fungi
Fungi	*Lachnellula willkommii*	Fungi
Fungi	*Leucoagaricus americanus*	Fungi
Fungi	*Leucocoprinus cretaceus*	Fungi
Fungi	*Melampsoridium hiratsukanum*	Fungi
Fungi	*Meria laricis*	Fungi
Fungi	*Mutinus ravenelii*	Fungi
Fungi	*Mycosphaerella pini*	Fungi
Fungi	*Nematostoma parasiticum*	Fungi
Fungi	*Ophiostoma novo-ulmi*	Fungi
Fungi	*Ophiostoma ulmi*	Fungi
Fungi	*Peziza cerea*	Fungi
Fungi	*Phaeocryptopus gaeumannii*	Fungi
Fungi	*Phaeolepiota aurea*	Fungi
Fungi	*Phellinus tuberculosus*	Fungi
Fungi	*Phylloporia ribis*	Fungi
Fungi	*Phytophthora cambivora*	Fungi
Fungi	*Phytophthora fragariae*	Fungi
Fungi	*Phytophthora gonapodyides*	Fungi
Fungi	*Phytophthora megasperma*	Fungi
Fungi	*Phytophthora plurivora*	Fungi
Fungi	*Phytophthora ramorum*	Fungi
Fungi	*Phytophthora rubi*	Fungi
Fungi	*Phytophthora syringae*	Fungi
Fungi	*Pisolithus arhizus*	Fungi
Fungi	*Podosphaera mors-uvae*	Fungi
Fungi	*Psilocybe cyanescens*	Fungi
Fungi	*Rhabdocline pseudotsugae*	Fungi
Fungi	*Stromatinia cepivora*	Fungi
Fungi	*Stropharia rugosoannulata*	Fungi
Fungi	*Stropholoma aurantiaca*	Fungi
Fungi	*Stropholoma percevalii*	Fungi
Fungi	*Suillus grevillei*	Fungi
Fungi	*Taphrina acericola*	Fungi
Fungi	*Taphrina ulmi*	Fungi
Fungi	*Tricholoma psammopus*	Fungi
Fungi	*Volvariella volvacea*	Fungi

Species group	Scientific name	Expert group
Collembola	*Ceratophysella gibbosa*	Terrestrial and Limnic Invertebrates
Collembola	*Cryptopygus thermophilus*	Terrestrial and Limnic Invertebrates
Collembola	*Desoria trispinata*	Terrestrial and Limnic Invertebrates
Collembola	*Folsomia penicula*	Terrestrial and Limnic Invertebrates
Collembola	*Folsomia similis*	Terrestrial and Limnic Invertebrates
Collembola	*Friesea sublimis*	Terrestrial and Limnic Invertebrates
Collembola	*Hypogastrura serrata*	Terrestrial and Limnic Invertebrates
Collembola	*Lepidocyrtus curvicollis*	Terrestrial and Limnic Invertebrates
Collembola	*Lepidocyrtus pallidus*	Terrestrial and Limnic Invertebrates
Collembola	*Lepidocyrtus weidneri*	Terrestrial and Limnic Invertebrates
Collembola	*Onychiurus folsomi*	Terrestrial and Limnic Invertebrates
Collembola	*Onychiurus normalis*	Terrestrial and Limnic Invertebrates
Collembola	*Orchesella quinquefasciata*	Terrestrial and Limnic Invertebrates
Collembola	*Proisotoma subminuta*	Terrestrial and Limnic Invertebrates
Collembola	*Protaphorura fimata*	Terrestrial and Limnic Invertebrates
Collembola	*Sinella curviseta*	Terrestrial and Limnic Invertebrates
Collembola	*Sinella tenebricosa*	Terrestrial and Limnic Invertebrates
Collembola	*Sminthurinus niger*	Terrestrial and Limnic Invertebrates
Collembola	*Sminthurinus trinotatus*	Terrestrial and Limnic Invertebrates
Collembola	*Thalassaphorura encarpata*	Terrestrial and Limnic Invertebrates
Porifera, Cnidaria, Ctenophora	*Cordylophora caspia*	Marine invertebrates
Porifera, Cnidaria, Ctenophora	*Diadumene lineata*	Marine invertebrates
Porifera, Cnidaria, Ctenophora	*Gonionemus vertens*	Marine invertebrates
Porifera, Cnidaria, Ctenophora	*Mnemiopsis leidyi*	Marine invertebrates
Diptera	*Braula coeca*	Terrestrial and Limnic Invertebrates
Diptera	*Contarinia pisi*	Terrestrial and Limnic Invertebrates
Diptera	*Contarinia pyrivora*	Terrestrial and Limnic Invertebrates
Diptera	*Culex pipiens*	Terrestrial and Limnic Invertebrates
Diptera	*Dasineura mali*	Terrestrial and Limnic Invertebrates
Diptera	*Dasineura pyri*	Terrestrial and Limnic Invertebrates
Diptera	*Drosophila busckii*	Terrestrial and Limnic Invertebrates
Diptera	*Drosophila hydei*	Terrestrial and Limnic Invertebrates
Diptera	*Drosophila immigrans*	Terrestrial and Limnic Invertebrates
Diptera	*Drosophila melanogaster*	Terrestrial and Limnic Invertebrates
Diptera	*Feltiella acarisuga*	Terrestrial and Limnic Invertebrates
Diptera	*Gasterophilus intestinalis*	Terrestrial and Limnic Invertebrates
Diptera	*Haematobosca stimulans*	Terrestrial and Limnic Invertebrates
Diptera	*Hydrotaea aenescens*	Terrestrial and Limnic Invertebrates
Diptera	*Hypoderma lineatum*	Terrestrial and Limnic Invertebrates
Diptera	*Janetiella siskiyou*	Terrestrial and Limnic Invertebrates
Diptera	*Megaselia gregaria*	Terrestrial and Limnic Invertebrates
Diptera	*Melophagus ovinus*	Terrestrial and Limnic Invertebrates
Diptera	*Oestrus ovis*	Terrestrial and Limnic Invertebrates
Diptera	*Strobilomyia laricicola*	Terrestrial and Limnic Invertebrates
Diptera	*Telmatogeton japonicus*	Terrestrial and Limnic Invertebrates
Diptera	*Thoracochaeta seticosta*	Terrestrial and Limnic Invertebrates
Thysanoptera	*Chaetanaphothrips orchidii*	Terrestrial and Limnic Invertebrates
Thysanoptera	*Echinothrips americanus*	Terrestrial and Limnic Invertebrates
Thysanoptera	*Frankliniella occidentalis*	Terrestrial and Limnic Invertebrates
Thysanoptera	*Selenothrips rubrocinctus*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Dacnusa sibirica*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Hoplocampa minuta*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Hypoponera punctatissima*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Leptomastix dactylopii*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Linepithema humile*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Megastigmus spermotrophus*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Nematus spiraeae*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Polistes nimpha*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Pristiphora angulata*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Pristiphora erichsonii*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Pristiphora wesmaeli*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Temnothorax crassispinus*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Temnothorax unifasciatus*	Terrestrial and Limnic Invertebrates

Species group	Scientific name	Expert group
Svalbard		
Magnoliophyta, Pinophyta, Pteridophyta	*Achillea millefolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alchemilla subcrenata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthriscus sylvestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Barbarea vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Poa annua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex acetosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Seksjon Ruderalia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stellaria media*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tripleurospermum maritimum*	Vascular plants
Mammalia	*Microtus levis*	Mammals

Appendix 2

Appendix 2 is a list of all 'door knockers' considered. The list is arranged by species group, and thereafter alphabetically by species name. All the species included are from mainland Norway and Norwegian territorial waters. No 'door knockers' are included for Svalbard. More than half of the species listed are impact-assessed, see the "Results" chapter.

Species group	Scientific name	Expert group
Algae	*Agardhiella subulata*	Algae
Algae	*Anotrichium furcellatum*	Algae
Algae	*Antithamnion densum*	Algae
Algae	*Antithamnionella spirographidis*	Algae
Algae	*Antithamnionella ternifolia*	Algae
Algae	*Asparagopsis armata*	Algae
Algae	*Chara connivens*	Algae
Algae	*Corynophlaea verruculiformis*	Algae
Algae	*Cryptonemia hibernica*	Algae
Algae	*Gracilaria vermiculophylla*	Algae
Algae	*Grateloupia subpectinata*	Algae
Algae	*Grateloupia turuturu*	Algae
Algae	*Lomentaria hakodatensis*	Algae
Algae	*Polyopes lancifolius*	Algae
Algae	*Polysiphonia senticulosa*	Algae
Algae	*Polysiphonia subtilissima*	Algae
Algae	*Solieria chordalis*	Algae
Algae	*Ulva pertusa*	Algae
Algae	*Undaria pinnatifida*	Algae
Amphibia, Reptilia	*Emys orbicularis*	Amphibia, Reptilia
Amphibia, Reptilia	*Rana ridibunda*	Amphibia, Reptilia
Branchiopoda, Echinodermata, Tunicata	*Botrylloides violaceus*	Marine invertebrates
Branchiopoda, Echinodermata, Tunicata	*Corella eumyota*	Marine invertebrates
Branchiopoda, Echinodermata, Tunicata	*Didemnum vexillum*	Marine invertebrates
Branchiopoda, Echinodermata, Tunicata	*Perophora japonica*	Marine invertebrates
Coleoptera	*Acrotrichis sanctaehelenae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Agrilus anxius*	Terrestrial and Limnic Invertebrates
Coleoptera	*Agrilus planipennis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Anoplophora chinensis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Anoplophora glabripennis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Carpelimus zealandicus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Clambus simsoni*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptophilus integer*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptophilus obliteratus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cynaeus angustus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Diabrotica virgifera*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dodecastichus inflatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Epitrix cucumeris*	Terrestrial and Limnic Invertebrates
Coleoptera	*Epitrix similaris*	Terrestrial and Limnic Invertebrates
Coleoptera	*Epitrix tuberis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Gabronthus sulcifrons*	Terrestrial and Limnic Invertebrates
Coleoptera	*Glischrochilus quadrisignatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Gnathotrichus materiarius*	Terrestrial and Limnic Invertebrates
Coleoptera	*Hippodamia convergens*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ips cembrae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ips subelongatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Leptinotarsa decemlineata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Lithostygnus serripennis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Luperomorpha xanthodera*	Terrestrial and Limnic Invertebrates
Coleoptera	*Migneauxia lederi*	Terrestrial and Limnic Invertebrates
Coleoptera	*Oenopia conglobata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Otiorhynchus aurifer*	Terrestrial and Limnic Invertebrates
Coleoptera	*Otiorhynchus crataegi*	Terrestrial and Limnic Invertebrates
Coleoptera	*Otiorhynchus dieckmanni*	Terrestrial and Limnic Invertebrates
Coleoptera	*Otiorhynchus salicicola*	Terrestrial and Limnic Invertebrates

Species group	Scientific name	Expert group
Coleoptera	*Otiorhynchus smreczynskii*	Terrestrial and Limnic Invertebrates
Coleoptera	*Otiorhynchus tenebricosus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Phloeosinus aubei*	Terrestrial and Limnic Invertebrates
Coleoptera	*Phloeosinus rudis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Phloeosinus thujae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Quedius scintillans*	Terrestrial and Limnic Invertebrates
Coleoptera	*Rhyzobius chrysomeloides*	Terrestrial and Limnic Invertebrates
Coleoptera	*Stricticollis tobias*	Terrestrial and Limnic Invertebrates
Coleoptera	*Tetropium gabrieli*	Terrestrial and Limnic Invertebrates
Mollusca	*Crassostrea virginica*	Marine invertebrates
Mollusca	*Dreissena bugensis*	Marine invertebrates
Mollusca	*Dreissena polymorpha*	Marine invertebrates
Mollusca	*Ocenebra inornata*	Marine invertebrates
Mollusca	*Ostrea chilensis*	Marine invertebrates
Mollusca	*Rapana venosa*	Marine invertebrates
Mollusca	*Urosalpinx cinerea*	Marine invertebrates
Arachnida	*Dicranopalpus ramosus*	Terrestrial and Limnic Invertebrates
Arachnida	*Odiellus spinosus*	Terrestrial and Limnic Invertebrates
Arachnida	*Oligolophus meadii*	Terrestrial and Limnic Invertebrates
Arachnida	*Opilio ruzickai*	Terrestrial and Limnic Invertebrates
Arachnida	*Parasteatoda tepidariorum*	Terrestrial and Limnic Invertebrates
"Pisces"	*Anguilla japonica*	Fish
"Pisces"	*Anguilla rostrata*	Fish
"Pisces"	*Barbatula barbatula*	Fish
"Pisces"	*Carassius gibelio*	Fish
"Pisces"	*Cobitis taenia*	Fish
"Pisces"	*Culaea inconstans*	Fish
"Pisces"	*Hypophthalmichthys nobilis*	Fish
"Pisces"	*Micropogonias undulatus*	Fish
"Pisces"	*Misgurnus fossilis*	Fish
"Pisces"	*Neogobius melanostomus*	Fish
"Pisces"	*Pelecus cultratus*	Fish
"Pisces"	*Rhodeus sericeus*	Fish
"Pisces"	*Sebastes schlegelii*	Fish
"Pisces"	*Silurus glanis*	Fish
"Pisces"	*Umbra pygmaea*	Fish
"Pisces"	*Vimba vimba*	Fish
Platyhelminthes	*Bothriocephalus acheilognathi*	Roundworms and Flatworms
Platyhelminthes	*Echinococcus multilocularis*	Roundworms and Flatworms
Platyhelminthes	*Pseudobacciger harengulae*	Roundworms and Flatworms
Pycnogonida	*Ammothea hilgendorfi*	Marine invertebrates
Magnoliophyta, Pinophyta, Pteridophyta	*Acer saccharum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aronia arbutifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aronia melanocarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euonymus sachalinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lysichiton camtschatcensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus asiatica*	Vascular plants
Crustacea	*Amphibalanus amphitrite*	Marine invertebrates
Crustacea	*Callinectes sapidus*	Marine invertebrates
Crustacea	*Cercopagis pengoi*	Marine invertebrates
Crustacea	*Cordioniscus stebbingi*	Terrestrial and Limnic Invertebrates
Crustacea	*Daphnia parvula*	Terrestrial and Limnic Invertebrates
Crustacea	*Elminius modestus*	Marine invertebrates
Crustacea	*Evadne anonyx*	Marine invertebrates
Crustacea	*Gammarus tigrinus*	Marine invertebrates
Crustacea	*Hemigrapsus sanguineus*	Marine invertebrates
Crustacea	*Hemigrapsus takanoi*	Marine invertebrates
Crustacea	*Palaemon macrodactylus*	Marine invertebrates
Crustacea	*Porcellio dilatatus*	Terrestrial and Limnic Invertebrates
Crustacea	*Trichorhina tomentosa*	Terrestrial and Limnic Invertebrates
Annelida	*Ficopomatus enigmaticus*	Marine invertebrates
Annelida	*Hydroides dianthus*	Marine invertebrates

Species group	Scientific name	Expert group
Annelida	*Marenzelleria neglecta*	Marine invertebrates
Myriapoda	*Oxidus gracilis*	Terrestrial and Limnic Invertebrates
Myriapoda	*Poratia digitata*	Terrestrial and Limnic Invertebrates
Bryozoa	*Bugula neritina*	Marine invertebrates
Bryozoa	*Bugula stolonifera*	Marine invertebrates
Bryozoa	*Tricellaria inopinata*	Marine invertebrates
Bryozoa	*Watersipora subtorquata*	Marine invertebrates
Anthocerotophyta, Bryophyta, Marchantiophyta	*Lophocolea semiteres*	Mosses
Anthocerotophyta, Bryophyta, Marchantiophyta	*Orthodontium lineare*	Mosses
Hemiptera	*Anthocoris butleri*	Terrestrial and Limnic Invertebrates
Hemiptera	*Arocatus longiceps*	Terrestrial and Limnic Invertebrates
Hemiptera	*Cacopsylla rhododendri*	Terrestrial and Limnic Invertebrates
Hemiptera	*Corythucha ciliata*	Terrestrial and Limnic Invertebrates
Hemiptera	*Halyomorpha halys*	Terrestrial and Limnic Invertebrates
Hemiptera	*Nysius huttoni*	Terrestrial and Limnic Invertebrates
Hemiptera	*Orius laevigatus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Oxycarenus lavaterae*	Terrestrial and Limnic Invertebrates
Hemiptera	*Quadraspidiotus perniciosus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Stephanitis takeyai*	Terrestrial and Limnic Invertebrates
Mammalia	*Castor canadensis*	Mammals
Mammalia	*Myocastor coypus*	Mammals
Mammalia	*Odocoileus virginianus*	Mammals
Mammalia	*Ovis aries musimon*	Mammals
Mammalia	*Procyon lotor*	Mammals
Nematoda	*Angiostrongylus vasorum*	Roundworms and Flatworms
Nematoda	*Bursaphelenchus xylophilus*	Roundworms and Flatworms
Nematoda	*Meloidogyne chitwoodi*	Roundworms and Flatworms
Nematoda	*Meloidogyne fallax*	Roundworms and Flatworms
Nematoda	*Meloidogyne minor*	Roundworms and Flatworms
Lepidoptera	*Cacoecimorpha pronubana*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Cameraria ohridella*	Terrestrial and Limnic Invertebrates
Fungi	*Agrocybe rivulosa*	Fungi
Fungi	*Ciboria rufofusca*	Fungi
Fungi	*Clathrus archeri*	Fungi
Fungi	*Clathrus ruber*	Fungi
Fungi	*Descolea antarctica*	Fungi
Fungi	*Gymnopus luxurians*	Fungi
Fungi	*Lactarius circellatus*	Fungi
Fungi	*Leucoagaricus melanotrichus*	Fungi
Fungi	*Leucocoprinus birnbaumii*	Fungi
Fungi	*Leucocoprinus brebissonii*	Fungi
Fungi	*Leucocoprinus cepistipes*	Fungi
Fungi	*Leucocoprinus straminellus*	Fungi
Fungi	*Panaeolus cyanescens*	Fungi
Fungi	*Psilocybe cubensis*	Fungi
Fungi	*Suillus amabilis*	Fungi
Fungi	*Suillus asiaticus*	Fungi
Fungi	*Suillus cavipes*	Fungi
Fungi	*Suillus ochraceoroseus*	Fungi
Fungi	*Suillus placidus*	Fungi
Fungi	*Suillus plorans*	Fungi
Fungi	*Suillus tridentinus*	Fungi
Fungi	*Suillus viscidus*	Fungi
Fungi	*Tremella simplex*	Fungi
Collembola	*Ceratophysella engadinensis*	Terrestrial and Limnic Invertebrates
Porifera, Cnidaria, Ctenophora	*Celtodoryx ciocalyptoides*	Marine invertebrates
Porifera, Cnidaria, Ctenophora	*Edwardsiella lineata*	Marine invertebrates
Diptera	*Aedes albopictus*	Terrestrial and Limnic Invertebrates
Diptera	*Aphidoletes abietis*	Terrestrial and Limnic Invertebrates
Diptera	*Blepharipa schineri*	Terrestrial and Limnic Invertebrates
Diptera	*Braula schmitzi*	Terrestrial and Limnic Invertebrates
Diptera	*Chymomyza amoena*	Terrestrial and Limnic Invertebrates

Species group	Scientific name	Expert group
Diptera	*Clytiomya continua*	Terrestrial and Limnic Invertebrates
Diptera	*Coenosia attenuata*	Terrestrial and Limnic Invertebrates
Diptera	*Dasineura kellneri*	Terrestrial and Limnic Invertebrates
Diptera	*Dohrniphora cornuta*	Terrestrial and Limnic Invertebrates
Diptera	*Heringia latitarsis*	Terrestrial and Limnic Invertebrates
Diptera	*Liriomyza huidobrensis*	Terrestrial and Limnic Invertebrates
Diptera	*Liriomyza sativae*	Terrestrial and Limnic Invertebrates
Diptera	*Liriomyza trifolii*	Terrestrial and Limnic Invertebrates
Diptera	*Megaselia scalaris*	Terrestrial and Limnic Invertebrates
Diptera	*Micropygus vagans*	Terrestrial and Limnic Invertebrates
Diptera	*Monarthropalpus flavus*	Terrestrial and Limnic Invertebrates
Diptera	*Phasia barbifrons*	Terrestrial and Limnic Invertebrates
Diptera	*Resseliella conicola*	Terrestrial and Limnic Invertebrates
Diptera	*Resseliella skuhravyorum*	Terrestrial and Limnic Invertebrates
Diptera	*Rhagoletis cingulata*	Terrestrial and Limnic Invertebrates
Diptera	*Rhagoletis indifferens*	Terrestrial and Limnic Invertebrates
Diptera	*Strobilomyia infrequens*	Terrestrial and Limnic Invertebrates
Diptera	*Strobilomyia melania*	Terrestrial and Limnic Invertebrates
Diptera	*Sturmia bella*	Terrestrial and Limnic Invertebrates
Diptera	*Tephritis praecox*	Terrestrial and Limnic Invertebrates
Diptera	*Thoracochaeta johnsoni*	Terrestrial and Limnic Invertebrates
Thysanoptera	*Thrips palmi*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Megastigmus pinus*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Megastigmus suspectus*	Terrestrial and Limnic Invertebrates

Appendix 3

Appendix 3 is a list of alien species observed in Norway, but that are not thought to be able to reproduce in Norwegian nature in the next 50 years. The list is arranged first by species group, and thereafter alphabetically by the species name. Species from mainland Norway and Norwegian territorial waters are listed first, followed by species from Svalbard. None of the species in this list have been impact-assessed.

Species group	Scientific name	Expert group
Norway and the Norwegian territorial waters		
Amphibia, Reptilia	*Trachemys scripta*	Amphibia, Reptilia
Coleoptera	*Acanthoscelides obtectus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Alphitobius laevigatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Anthrenus olgae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Araecerus fasciculatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Attagenus fasciatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Attagenus unicolor*	Terrestrial and Limnic Invertebrates
Coleoptera	*Attagenus woodroffei*	Terrestrial and Limnic Invertebrates
Coleoptera	*Bostrychoplites cornutus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Bruchus lentis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Bruchus pisorum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Buprestis aurulenta*	Terrestrial and Limnic Invertebrates
Coleoptera	*Callosobruchus analis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Callosobruchus chinensis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Callosobruchus maculatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Calosoma auropunctatum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Carabus auratus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Carpophilus dimidiatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Carpophilus ligneus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Caryedon serratus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Chlorophorus glabromaculatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptolestes capensis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptolestes ferrugineus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptolestes pusilloides*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptolestes pusillus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Cryptolestes turcicus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dermestes ater*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dermestes frischii*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dermestes maculatus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Dienerella ruficollis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Epauloecus unicolor*	Terrestrial and Limnic Invertebrates
Coleoptera	*Gibbium psylloides*	Terrestrial and Limnic Invertebrates
Coleoptera	*Gnatocerus cornutus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Gracilia minuta*	Terrestrial and Limnic Invertebrates
Coleoptera	*Herophila tristis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Hypothenemus hampei*	Terrestrial and Limnic Invertebrates
Coleoptera	*Lasioderma serricorne*	Terrestrial and Limnic Invertebrates
Coleoptera	*Latheticus oryzae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Lyctus brunneus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Mimosestes mimosae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Nathrius brevipennis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Nausibius clavicornis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Necrobia ruficollis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Necrobia rufipes*	Terrestrial and Limnic Invertebrates
Coleoptera	*Oryzaephilus mercator*	Terrestrial and Limnic Invertebrates
Coleoptera	*Oryzaephilus surinamensis*	Terrestrial and Limnic Invertebrates
Coleoptera	*Otiorhynchus corruptor*	Terrestrial and Limnic Invertebrates
Coleoptera	*Palorus ratzeburgii*	Terrestrial and Limnic Invertebrates
Coleoptera	*Palorus subdepressus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Plagionotus detritus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ptilodactyla exotica*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ptinus tectus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Rhyzopertha dominica*	Terrestrial and Limnic Invertebrates

Species group	Scientific name	Expert group
Coleoptera	*Sitophilus granarius*	Terrestrial and Limnic Invertebrates
Coleoptera	*Sitophilus oryzae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Sitophilus zeamais*	Terrestrial and Limnic Invertebrates
Coleoptera	*Stegobium paniceum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Tenebrio obscurus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Tenebroides mauritanicus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Thylodrias contractus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Tribolium castaneum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Tribolium confusum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Tribolium destructor*	Terrestrial and Limnic Invertebrates
Coleoptera	*Trigonogenius globulus*	Terrestrial and Limnic Invertebrates
Coleoptera	*Trogoderma angustum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Trogoderma granarium*	Terrestrial and Limnic Invertebrates
Coleoptera	*Trogoxylon impressum*	Terrestrial and Limnic Invertebrates
Mollusca	*Hawaiia minuscula*	Terrestrial and Limnic Invertebrates
Mollusca	*Lehmannia valentiana*	Terrestrial and Limnic Invertebrates
Mollusca	*Lucilla singleyana*	Terrestrial and Limnic Invertebrates
Mollusca	*Venerupis philippinarum*	Marine invertebrates
Zygentoma	*Thermobia domestica*	Terrestrial and Limnic Invertebrates
Arachnida	*Uloborus plumipes*	Terrestrial and Limnic Invertebrates
"Pisces"	*Glossanodon leioglossus*	Fish
"Pisces"	*Oncorhynchus keta*	Fish
Aves	*Alectoris rufa*	Birds
Aves	*Amandava amandava*	Birds
Aves	*Aptenodytes patagonicus*	Birds
Aves	*Ardeola bacchus*	Birds
Aves	*Athene noctua*	Birds
Aves	*Butorides striata*	Birds
Aves	*Cardinalis cardinalis*	Birds
Aves	*Carduelis sinica*	Birds
Aves	*Carpodacus roseus*	Birds
Aves	*Carpodacus rubicilloides*	Birds
Aves	*Cathartes aura*	Birds
Aves	*Chrysolophus pictus*	Birds
Aves	*Ciconia abdimii*	Birds
Aves	*Colinus virginianus*	Birds
Aves	*Emberiza bruniceps*	Birds
Aves	*Emberiza elegans*	Birds
Aves	*Eophona personata*	Birds
Aves	*Eudyptes chrysolophus*	Birds
Aves	*Gypaetus barbatus*	Birds
Aves	*Icterus wagleri*	Birds
Aves	*Passerina amoena*	Birds
Aves	*Passerina ciris*	Birds
Aves	*Passerina cyanea*	Birds
Aves	*Pelecanus crispus*	Birds
Aves	*Pelecanus onocrotalus*	Birds
Aves	*Pelecanus rufescens*	Birds
Aves	*Phoenicopterus chilensis*	Birds
Aves	*Phoenicopterus minor*	Birds
Aves	*Phoenicopterus roseus*	Birds
Aves	*Psittacula krameri*	Birds
Aves	*Pycnonotus aurigaster*	Birds
Aves	*Pygoscelis papua*	Birds
Aves	*Serinus mozambicus*	Birds
Aves	*Streptopelia roseogrisea risoria*	Birds
Aves	*Streptopelia senegalensis*	Birds
Aves	*Thalassarche chrysostoma*	Birds
Aves	*Uragus sibiricus*	Birds
Aves	*Xanthocephalus xanthocephalus*	Birds
Magnoliophyta, Pinophyta, Pteridophyta	*Abies nordmanniana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Abutilon theophrasti*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Acanthoxanthium spinosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer barbinerve*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer japonicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer mono*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer monspessulanum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer saccharinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acer sieboldianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	Acer sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Achillea filipendulina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Achillea tomentosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acinos alpinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aconitum lycoctonum lasiostomum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Actaea rubra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Actinidia arguta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Actinidia chinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Actinidia deliciosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Actinidia kolomikta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Adenophora coronopifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Adonis annua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aegilops cylindrica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aesculus ×carnea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agastache rugosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agastache urticifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ageratum houstonianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agropyron cristatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agrostemma gracile*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agrostis scabra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ailanthus altissima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alcea pallida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alcea setosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium cepa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium porrum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium sativum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alopecurus myosuroides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Althaea officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alyssum desertorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alyssum hirsutum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus albus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus blitum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus caudatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus deflexus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus palmeri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus quitensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus spinosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amaranthus viridis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ambrosia coronopifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ambrosia trifida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ammi majus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ammi visnaga*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amsinckia intermedia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amsinckia lycopsoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amsinckia retrorsa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Amsinckia tesselata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anacyclus clavatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anagallis foemina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anchusa arvensis orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anemone coronaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anemone scabiosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anethum graveolens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anisantha diandra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anisantha madritensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anoda cristata*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Anthemis austriaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthoxanthum aristatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthriscus caucalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Anthyllis lotoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Apium graveolens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arachis hypogaea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aralia elata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arenaria leptoclados*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Argemone mexicana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Argyranthemum frutescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aristolochia macrophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arnica mollis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arrhenatherum elatius bulbosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia annua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia austriaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia biennis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia dracunculus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Asclepias* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Asperula arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Asperula orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Asphodelus fistulosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Astilbe japonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Astragalus boeticus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Astragalus scorpioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Atriplex hortensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Atriplex rosea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Atriplex sagittata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Atriplex tatarica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aubrieta ×cultorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena barbata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena brevis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena macrocarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena sterilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Axyris amaranthoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Azolla filiculoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ballota nigra meridionalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Barbarea intermedia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Barbarea verna*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bassia scoparia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Beta vulgaris vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Betula fruticosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bidens ferulifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bidens frondosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bidens pilosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bidens radiata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bidens vulgata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bifora testiculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bistorta affinis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bistorta amplexicaulis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brachycome iberidifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica elongata elongata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica rapa rapifera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Brassica tournefortii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Briza maxima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Briza minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus japonicus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus lanceolatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus lepidus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus racemosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus squarrosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bryonia cretica*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Bulbostylis capillaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bunium bulbocastanum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bupleurum rotundifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Calandrinia menziesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Calceolaria integrifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Calceolaria scabiosaefolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Callistephus chinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Calystegia pulchra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula carpatica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula cochleariifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula lactiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula medium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula punctata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula pyramidalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Campanula rapunculus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cannabis sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Capsicum annuum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carduus hamulosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carduus tenuiflorus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carex bohemica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carex montana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carex vulpina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carpobrotus edulis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carthamus lanatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carthamus tinctorius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cassia* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Catapodium rigidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Catolobus pendulus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Caucalis platycarpos*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Celosia argentea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea algeriensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea aspera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea calcitrapa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea cyanoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea diffusa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea melitensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea pallescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea solstitialis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centella asiatica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cephalaria alpina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cephalaria syriaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cerastium dubium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ceratochloa carinata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ceratochloa cathartica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cerinthe major*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cerinthe minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaenomeles speciosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chaenorhinum origanifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecrista nictitans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecytisus hirsutus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecytisus purpureus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chamaecytisus supinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chelone obliqua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium ambrosioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium anthelminticum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium berlandieri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium borbasioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium botrys*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium capitatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium foliosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium giganteum*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium hircinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium karoi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium missouriense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium multifidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium opulifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium pratericola*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium probstii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium pumilio*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium salinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium schraderianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium simplex*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium striatiforme*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium strictum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium urbicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium virgatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium vulvaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chorispora tenella*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cicer arietinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cichorium endivia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cimicifuga racemosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Citrullus lanatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Citrus* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clarkia amoena*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clarkia pulchella*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clarkia unguiculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clematis flammula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cleome spinosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Clinopodium nepeta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coleostephus myconis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Collomia cavanillesi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Collomia linearis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Conringia orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Consolida ajacis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Consolida orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Consolida regalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Conyza bonariensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Conyza sumatrensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coreopsis tinctoria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coreopsis verticillata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cornus mas*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Coronilla scorpioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corrigiola litoralis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corydalis aurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Corydalis ophiocarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cosmos bipinnatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotinus coggygria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotoneaster rotundifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotula australis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cotula squalida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crambe hispanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crepis nicaeensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crepis rubra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crocosmia ×crocosmiiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Crocosmia aurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cruciata laevipes*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cruciata pedemontana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cryophytum nodiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cucumis melo*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cucumis sativus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cucurbita pepo*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cuminum cyminum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cuscuta australis*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Cuscuta campestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cuscuta epilinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cuscuta monogyna*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cuscuta suaveolens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cyclospermum leptophyllum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cynodon dactylon*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cynoglossum amabile*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cynoglossum glochidiatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cynosurus echinatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cyperus eragrostis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cytisus ×praecox*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cytisus decumbens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dactylorhiza baltica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dahlia ×pinnata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Datura innoxia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Datura stramonium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Daucus carota sativus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Delphinium austriacum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Delphinium grandiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Descurainia incana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Descurainia pinnata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Deutzia scabra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dianthus carthusianorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dianthus caryophyllus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dianthus chinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dianthus cruentus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dianthus knappii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dichondra micrantha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Digitaria sanguinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Diplotaxis erucoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Doronicum orientale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dorycnium pentaphyllum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Draba aizoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dracocephalum moldavicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dracocephalum nutans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinacea purpurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinochloa colonum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinochloa esculenta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echinocystis lobata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Echium plantagineum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elaeosticta lutea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elatine alsiniastrum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eleusine indica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eleutherococcus sentiocosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elsholtzia ciliata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elymus canadensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elymus hispidus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elymus trachycaulus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elytrigia atherica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elytrigia elongata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Emex spinosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epilobium komarovianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Epimedium ×rubrum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eragrostis cilianensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eragrostis minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eremopoa persica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eremopyrum triticeum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erigeron speciosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erodium botrys*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erodium manescavii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erodium moschatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eruca vesicaria*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Erucaria hispanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erucastrum supinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eryngium bourgatii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erysimum ×marshallii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erysimum cheiri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erysimum repandum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eschscholzia caespitosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eschscholzia californica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eucalyptus gunnii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euclidium syriacum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Eudianthe coeli-rosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euphorbia exigua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Euthamia graminifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fagopyrum esculentum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fagopyrum tataricum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fallopia baldschuanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ficus carica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Filago pyramidata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Filago vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fimbristylis autumnalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Foeniculum vulgare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Forsythia ×intermedia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Forsythia fortunei*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Frankenia pulverulenta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fuchsia* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fumaria capreolata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fumaria densiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fumaria muralis muralis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gagea spathacea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gaillardia pulchella*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galega ×hartlandii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galeopsis angustifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galeopsis segetum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium* sp. aff. *tricornutum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium spurium spurium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium tricornutum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gaudinia fragilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Genista anglica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gentiana septemfida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium ×magnificum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium bicknellii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium carolinianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium divaricatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Geranium rotundifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gilia capitata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gilia leptalea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gilia tricolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gladiolus ×hortulanus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gladiolus palustris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Glandularia pulchella*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Glaucium corniculatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Glebionis carinata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Glebionis coronaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Glycine max*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Groenlandia densa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Guizotia abyssinica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gypsophila elegans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gypsophila paniculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Gypsophila pilosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hablitzia tamnoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hedera colchica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hedera hibernica*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Hedychium coronarium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus annuus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus debilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus decapetalus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus petiolaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helichrysum arenarium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Heliophila linearifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Heliotropium europaeum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helosciadium nodiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hemerocallis fulva*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hemizonia pungens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Herniaria hirsuta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Herniaria polygama*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hesperis pycnotricha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hibiscus trionum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum comosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum compressum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum distichon*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum marinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum murinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum secalinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum vulgare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hosta fortunei*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hosta ventricosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hylotelephium spectabile*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hymenolobus procumbens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hypecoum pendulum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hypericum calycinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hypericum humifusum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hypochaeris glabra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ilex ×meserveae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Illecebrum verticillatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Impatiens balsamina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Inula conyzae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Inula ensifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ipomoea cairica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ipomoea coccinea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ipomoea hederacea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ipomoea lacunosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ipomoea purpurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ipomoea* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Iva xanthifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Juncus inflexus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Juniperus chinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Kickxia elatine crinita*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Kickxia elatine elatine*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Kickxia spuria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lactuca sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lactuca virosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lagoecia cuminoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lagurus ovatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lamarckia aurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lappula marginata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus annuus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus aphaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus cicera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus hirsutus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus inconspicuus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus incurvus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus ochrus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus odoratus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus pisiformis*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus sativus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lavandula angustifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lavandula multifida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lavatera thuringiaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Legousia hybrida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Legousia pentagonia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Legousia perfoliata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Legousia speculum-veneris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lens culinaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Leontodon saxatilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium bonariense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium perfoliatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium ramosissimum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium virginicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Liatris spicata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ligustrum japonicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lilium ×hollandicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Limnanthes douglasii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Limonium bonduellei*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Limonium sinuatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Limonium thouinii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linanthus dianthiflorus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linaria genistifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linaria incarnata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linaria maroccana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linaria pinifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linaria purpurea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linaria supina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linum bienne*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linum grandiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Linum usitatissimum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lobelia erinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lobelia inflata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lobelia urens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Logfia gallica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lolium remotum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lolium rigidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lonicera ligustrina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lotus angustissimus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lunaria rediviva*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus ×regalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus albus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus angustifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus arboreus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus hispanicus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lupinus luteus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lycium chinense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lycopersicon esculentum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lycopersicon racemigerum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lythrum ×scabrum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lythrum hyssopifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Madia glomerata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Madia sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malcolmia africana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malcolmia maritima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malope trifida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malva cretica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malva parviflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malva sylvestris mauritiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malva trimestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mantisalca salmantica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Marrubium vulgare*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Marsilea quadrifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Matthiola longipetala*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mauranthemum paludosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago arabica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago minima*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago polymorpha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago sativa glomerata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago truncatula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago turbinata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melampodium montanum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus dentatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus indicus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus infestus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus segetalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus wolgicus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melissa officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Menispermum canadense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha pulegium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mentha suaveolens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mertensia sibirica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mertensia virginica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Microlonchus* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Microthlaspi perfoliatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mimulus moschatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Minuartia laricifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Minuartia verna*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Misopates orontium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mitella* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Modiola caroliniana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mollugo verticillata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Monarda didyma*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Monarda fistulosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Monolepis nuttalliana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Mulgedium tataricum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Myagrum perfoliatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nemophila menziesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nepeta ×faassenii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nepeta nuda*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nepeta racemosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nicotiana ×sanderae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nicotiana alata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nicotiana rustica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nicotiana sylvestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nicotiana tabacum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Nigella damascena*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ocimum basilicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Odontites vernus vernus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera albipercurva*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera cambrica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera fallax*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera glazioviana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera hoelscheri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera laciniata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera lamarckiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera lindheimeri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera oakesiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera parviflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera perangusta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera perennis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera stricta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera villosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oenothera wienii*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Omphalodes linifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Onobrychis viciifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Origanum majorana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Origanum vulgare prismaticum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ornithogalum narbonense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ornithopus perpusillus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ornithopus pinnatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Orobanche gracilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Orthocarpus erianthus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Osteospermum jucundum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oxalis articulata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Oxalis pes-caprae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pachysandra terminalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Paeonia officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Panicum capillare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Panicum miliaceum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver argemone*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver dubium lecoqii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver hybridum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Papaver somniferum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Parentucellia viscosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Parietaria judaica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Parthenocissus quinquefolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Parthenocissus tricuspidata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Paspalum dilatatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Passiflora edulis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pedicularis comosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pennisetum setaceum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Penstemon* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Persicaria capitata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Persicaria lapathifolia brittingeri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Persicaria maculosa hirticaulis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Persicaria pensylvanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Persicaria salicifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Petunia ×hybrida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Petunia integrifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phacelia bipinnatifida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phacelia campanularia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phacelia minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phalaris angusta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phalaris brachystachys*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phalaris canariensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phalaris coerulescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phalaris minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phalaris paradoxa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phaseolus vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phellodendron amurense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Philadelphus ×virginalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phleum arenarium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phlox drummondii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phoenix dactylifera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physalis grisea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physalis ixocarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physalis peruviana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physalis philadelphica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physalis virginiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Physochlaina orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phyteuma scheuchzeri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phytolacca acinosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Picris echioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pimpinella anisum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pistia stratiotes*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Pisum sativum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Plagiobothrys scouleri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Plantago afra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Plantago arenaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Plantago coronopus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polycarpon tetraphyllum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polycnemum majus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polygonum bellardii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polygonum patulum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polypogon monspeliensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polypogon* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Portulaca oleracea sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla argyrophylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla atrosanguinea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla nepalensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla sterilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Potentilla supina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Primula auricula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Primula denticulata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Primula florindae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Primula juliae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus laurocerasus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus persica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pseudofumaria alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ptelea trifoliata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Puccinellia rupestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Puccinellia* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulicaria dysenterica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pulmonaria angustifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pyracantha coccinea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus hederaceus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus illyricus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus muricatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus psilostachys*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus sardous*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Raphanus raphanistrum landra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Raphanus sativus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rapistrum perenne*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rapistrum rugosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Reseda alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Reseda odorata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rheum undulatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rhodanthe chlorocephala*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rhodanthe manglesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rhododendron catawbiense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rhus coriaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ricinus communis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Roemeria hybrida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rorippa amphibia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rorippa palustris hispida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa ×alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa ×centifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa foetida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa gallica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa hugonis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa moyesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa multiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa sachalinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rosa xanthina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rostraria cristata*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Rubia peregrina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rubus phoenicolasius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex acetosella pyrenaicus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex conglomeratus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex fueginus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex obovatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex palustris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex patientia orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex pulcher*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex stenophyllus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex triangulivalvis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ruta graveolens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sagina micropetala*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×calodendron*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×holosericea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×pendulina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix ×stipularis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix aegyptiaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix* 'Brekkavier'	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salix elaeagnos*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salsola tragus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salvia ×sylvestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salvia officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salvia scabra*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Salvia viridis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Samolus valerandi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sanguisorba menziesii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sanvitalia procumbens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Satureja hortensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga ×schraderi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga cuneifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Saxifraga hostii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scandix pecten-veneris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Schizanthus pinnatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scorpiurus vermiculatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scorzonera hispanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scrophularia auriculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scrophularia scopolii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scrophularia scorodonia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scrophularia umbrosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Scrophularia vernalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Secale cereale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Securigera securidaca*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio abrotanifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio fluviatilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio maritimus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senna marilandica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senna obtusifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Setaria faberi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Setaria geniculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Setaria italica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Setaria pumila*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Setaria verticillata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sicyos angulatus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sida rhombifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sida spinosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sideritis montana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene antirrhina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene conoidea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene dichotoma*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene pendula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene stricta*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Silphium perfoliatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silybum marianum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium austriacum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium irio*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium luteum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium volgense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum carolinense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum ciliatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum curtipes*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum hendersonii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum laciniatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum marginatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum rostratum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum sarrachoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum sisymbriifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum sublobatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum tuberosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum villosum miniatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solanum villosum villosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Solidago rugosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Soliva sessilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorbus zahlbruckneri*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorghum bicolor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sorghum halepense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spartina* sp.	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spergularia platensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spinacia oleracea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea baldschuanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea blumei*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea canescens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Spiraea veitchii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stachys byzantina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stachys cretica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stachys menthifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stachys recta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stenotaphrum secundatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stephanandra incisa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum laeve*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum patulum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum shortii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphyotrichum squamatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Symphytum tauricum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Syringa ×chinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Syringa ×persica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Syringa emodi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Syringa komarowii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tagetes minuta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tagetes patula*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tanacetum corymbosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thalictrum lucidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thalictrum speciosissimum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thamnocalamus spathaceus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thelesperma gracile*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thermopsis fabacea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thermopsis montana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thladiantha dubia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thymus odoratissimus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thymus vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tilia ×europaea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tradescantia virginiana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tribulus terrestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium alexandrinum*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium angustifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium badium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium ciliolatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium glomeratum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium hybridum elegans*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium incarnatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium micranthum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium microcephalum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium pallidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium resupinatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium retusum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium rubens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium spumosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium striatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium subterraneum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium suffocatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium tridentatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella caerulea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella corniculata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella crassipes*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella foenum-graecum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella hamosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella laciniata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella monantha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trigonella procumbens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Triticum aestivum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Triticum compactum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Triticum spelta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Triticum turgidum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trollius yunnanensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tropaeolum majus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tropaeolum peregrinum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tropaeolum speciosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tulipa ×gesneriana*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Turgenia latifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ulex gallii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ulex minor*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Urtica gracilis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vaccaria hispanica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Valerianella carinata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Valerianella dentata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Valerianella eriocarpa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Valerianella rimosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum blattaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum chaixii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum densiflorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum ovalifolium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum phlomoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum phoeniceum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum pyramidatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum speciosum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbascum virgatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbena ×hybrida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbena bonariensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbena hastata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbena officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbena rigida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbena tenera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Verbesina encelioides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica anagalloides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica austriaca dentata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica catenata*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica cymbalaria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica peregrina xalapensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica repens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronicastrum virginicum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia articulata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia bithynica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia cretica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia cuspidata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia dumetorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia ervilia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia faba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia grandiflora*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia lutea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia melanops*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia narbonensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia pannonica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia sativa sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Viola ×williamsii*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Viola lutea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vitis riparia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vitis vinifera*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vitis vulpina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Weigela florida*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Wisteria sinensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Xanthium strumarium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Xeranthemum annuum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Zea mays*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Zinnia haageana*	Vascular plants
Myriapoda	*Decapauropus pseudomillotianus*	Terrestrial and Limnic Invertebrates
Myriapoda	*Hanseniella caldaria*	Terrestrial and Limnic Invertebrates
Hemiptera	*Cimex lectularis*	Terrestrial and Limnic Invertebrates
Hemiptera	*Dysdercus cingulatus*	Terrestrial and Limnic Invertebrates
Hemiptera	*Eurydema ventralis*	Terrestrial and Limnic Invertebrates
Hemiptera	*Spilostethus pandurus*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Blatella germanica*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Blatta orientalis*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Gryllus bimaculatus*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Locusta migratoria*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Panchlora nivea*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Periplaneta americana*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Periplaneta australasiae*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Periplaneta brunnea*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Pycnoscelus surinamensis*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Rhyparobia maderae*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Supella longipalpa*	Terrestrial and Limnic Invertebrates
Orthoptera, Blattodea, Dermaptera	*Tachycines asynamorus*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Cadra cautella*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Corcyra cephalonica*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Nemapogon granella*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Nemapogon variatella*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Sitotroga cerealella*	Terrestrial and Limnic Invertebrates
Fungi	*Clavulinopsis daigremontiana*	Fungi
Fungi	*Clitopilus passeckerianus*	Fungi
Fungi	*Conocybe intrusa*	Fungi
Fungi	*Hydnangium carneum*	Fungi
Fungi	*Hyphodontia microspora*	Fungi
Fungi	*Lepiota xanthophylla*	Fungi
Fungi	*Lysurus cruciatus*	Fungi
Fungi	*Mycena alphitophora*	Fungi
Fungi	*Peziza proteana*	Fungi
Fungi	*Phytophthora cinnamomi*	Fungi
Fungi	*Volvariella pusilla*	Fungi

Species group	Scientific name	Expert group
Fungi	*Xylaria arbuscula*	Fungi
Psocodea, Anoplura, Siphonaptera	*Badonnelia titei*	Terrestrial and Limnic Invertebrates
Psocodea, Anoplura, Siphonaptera	*Ctenocephalides felis*	Terrestrial and Limnic Invertebrates
Psocodea, Anoplura, Siphonaptera	*Dorypteryx domestica*	Terrestrial and Limnic Invertebrates
Psocodea, Anoplura, Siphonaptera	*Lepinotus patruelis*	Terrestrial and Limnic Invertebrates
Psocodea, Anoplura, Siphonaptera	*Liposcelis bostrychophila*	Terrestrial and Limnic Invertebrates
Psocodea, Anoplura, Siphonaptera	*Psyllipsocus ramburii*	Terrestrial and Limnic Invertebrates
Diptera	*Bradysia difformis*	Terrestrial and Limnic Invertebrates
Diptera	*Ceratitis capitata*	Terrestrial and Limnic Invertebrates
Diptera	*Contarinia quinquenotata*	Terrestrial and Limnic Invertebrates
Diptera	*Cordylobia anthropophaga*	Terrestrial and Limnic Invertebrates
Diptera	*Dermatobia hominis*	Terrestrial and Limnic Invertebrates
Diptera	*Drosophila repleta*	Terrestrial and Limnic Invertebrates
Diptera	*Rhopalomyia chrysanthemi*	Terrestrial and Limnic Invertebrates
Diptera	*Stomoxys calcitrans*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Aphidius colemani*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Aphidius ervi*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Eretmocerus eremicus*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Eurhadinoceraea ventralis*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Laelius pedatus*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Monomorium pharaonis*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Pheidole anastasii*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Pheidole punctatissima*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Tapinoma melanocephalum*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Tetramorium bicarinatum*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Urocerus flavicornis*	Terrestrial and Limnic Invertebrates
Svalbard		
Magnoliophyta, Pinophyta, Pteridophyta	*Achillea ptarmica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agrostemma githago*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agrostis capillaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alchemilla wichurae*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium cepa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alopecurus myosuroides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia absinthium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena sativa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Barbarea stricta*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Buglossoides arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Capsella bursa-pastoris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Carum carvi*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Chenopodium album*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Conringia orientalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dactylis glomerata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Descurainia sophia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Elytrigia repens repens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Equisetum arvense arvense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erodium cicutarium*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erysimum cheiranthoides*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Erysimum strictum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fagopyrum esculentum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Fallopia convolvulus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Festuca rubra megastachys*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galeopsis tetrahit*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium aparine*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Galium mollugo erectum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Helianthus annuus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hieracium vulgatum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Hordeum vulgare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Juncus squarrosus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lappula myosotis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lapsana communis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lathyrus pratensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidium densiflorum*	Vascular plants

Species group	Scientific name	Expert group
Magnoliophyta, Pinophyta, Pteridophyta	*Lepidotheca suaveolens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Malus ×domestica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago lupulina*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Medicago polymorpha*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Melilotus officinalis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Myosotis arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pisum sativum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Plantago media*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Poa palustris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Poa pratensis angustifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Poa pratensis irrigata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Poa trivialis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Polygonum aviculare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Prunus domestica domestica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Ranunculus repens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rorippa palustris palustris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rorippa sylvestris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex crispus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rumex longifolius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Secale cereale*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Senecio vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Silene latifolia alba*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sinapis arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sisymbrium altissimum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sonchus oleraceus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Stellaria graminea*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tanacetum vulgare*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Thlaspi arvense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium pratense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Trifolium repens*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tripleurospermum inodorum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Tussilago farfara*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Veronica longifolia*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Vicia sativa*	Vascular plants

Appendix 4

Appendix 4 is a list of all species that previously have been considered to be or have been treated as alien species, but that fall outside the delimitations of this project. No attempt has been made to compile a list of all species which have been excluded, and this list is therefore incomplete. All the species included are from mainland Norway and Norwegian territorial waters. No species are included from Svalbard. None of the species in this list have been impact-assessed.

Species group	Scientific name	Expert group
Algae	*Gracilaria gracilis*	Algae
Algae	*Sphaerococcus coronopifolius*	Algae
Coleoptera	*Anthrenus museorum*	Terrestrial and Limnic Invertebrates
Coleoptera	*Anthrenus scrophulariae*	Terrestrial and Limnic Invertebrates
Coleoptera	*Blaps mucronata*	Terrestrial and Limnic Invertebrates
Coleoptera	*Lasconotus jelskii*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ptinus raptor*	Terrestrial and Limnic Invertebrates
Coleoptera	*Ptinus villiger*	Terrestrial and Limnic Invertebrates
Mollusca	*Milax gagates*	Terrestrial and Limnic Invertebrates
Mollusca	*Teredo navalis*	Marine invertebrates
Zygentoma	*Lepisma saccharina*	Terrestrial and Limnic Invertebrates
"Pisces"	*Cyprinus carpio*	Fish
Aves	*Branta leucopsis*	Birds
Aves	*Columba livia*	Birds
Magnoliophyta, Pinophyta, Pteridophyta	*Acalypha brachystachya*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Achillea ptarmica*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Acorus calamus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aegopodium podagraria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Agrostemma githago*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Allium scorodoprasum scorodoprasum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Alopecurus pratensis pratensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Apera spica-venti*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Aquilegia vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Arctium lappa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Artemisia vulgaris*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Avena fatua*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus arvensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Bromus secalinus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Centaurea cyanus*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cerastium glomeratum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cota tinctoria*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Cytisus scoparius*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Dactylis glomerata*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Flueggea suffruticosa*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lolium perenne*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Lolium temulentum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Matricaria chamomilla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Phleum pratense pratense*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Pilea microphylla*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Rheum rhaponticum*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Schedonorus pratensis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Setaria viridis*	Vascular plants
Magnoliophyta, Pinophyta, Pteridophyta	*Sinapis alba*	Vascular plants
Crustacea	*Monocorophium sextonae*	Marine invertebrates
Annelida	*Alitta succinea*	Marine invertebrates
Annelida	*Alkmaria romijni*	Marine invertebrates
Lepidoptera	*Ephestia kuehniella*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Plodia interpunctella*	Terrestrial and Limnic Invertebrates
Lepidoptera	*Tineola bisselliella*	Terrestrial and Limnic Invertebrates
Fungi	*Agaricus phaeolepidotus*	Fungi
Fungi	*Colletotrichum trichellum*	Fungi
Fungi	*Gymnosporangium cornutum*	Fungi
Fungi	*Nectria galligena*	Fungi
Fungi	*Peziza ostracoderma*	Fungi

Species group	Scientific name	Expert group
Fungi	*Phytophthora cactorum*	Fungi
Fungi	*Podosphaera spiraeae*	Fungi
Fungi	*Sawadaea bicornis*	Fungi
Fungi	*Serpula lacrymans*	Fungi
Fungi	*Stromatinia gladioli*	Fungi
Psocodea, Anoplura, Siphonaptera	*Linognathus setosus*	Terrestrial and Limnic Invertebrates
Psocodea, Anoplura, Siphonaptera	*Pediculus humanus capitis*	Terrestrial and Limnic Invertebrates
Psocodea, Anoplura, Siphonaptera	*Phthirus pubis*	Terrestrial and Limnic Invertebrates
Diptera	*Hippobosca equina*	Terrestrial and Limnic Invertebrates
Diptera	*Hypoderma bovis*	Terrestrial and Limnic Invertebrates
Diptera	*Lipoptena cervi*	Terrestrial and Limnic Invertebrates
Diptera	*Musca domestica*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Apis mellifera*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Diglyphus isaea*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Encarsia formosa*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Nasonia vitripennis*	Terrestrial and Limnic Invertebrates
Hymenoptera	*Nematus tulunensis*	Terrestrial and Limnic Invertebrates

Appendix 5

Appendix 5 is a list of alien marine aquarium fish in Norway based upon feedback from Bergen Aquarium, Drøbak Aquarium, Polaria and Atlanterhavsparken. The list has been compiled by the expert group for fish. None of the species in this list have been considered or impact-assessed.

Order	Family	Species	Habitat	Distribution	Number of individuals "Atlanterhavs-parken"	Bergen Aquarium
Orectolobiformes	Hemiscylliidae	*Chiloscyllium punctatum*	tropical, reef-associated	Indo-West Pacific	3	
		Chiloscyllium sp.				x
	Ginglymostoma-tidae	*Ginglymostoma cirratum*	subtropical, reef-associated	Atlantic, Pacific		x
Carchariniformes	Carcharhinidae	*Carcharhinus melanopterus*	tropical, reef-associated	Indo-Pacific		x
Myliobatiformes	Dasyatidae	*Taeniura lymma*	tropical, reef-associated	Indo-West Pacific		x
Anguilliformes	Muraenidae	*Echidna nebulosa*	tropical, reef-associated	Indo-Pacific		x
		Gymnomuraena zebra	tropical, reef-associated	Indo-Pacific		x
Gobiesociformes	Gobiesocidae	*Diademichthys lineatus*	tropical, reef-associated	Western Indian Ocean	1	
Syngnathiformes	Syngnathidae	*Hippocampus abdominalis*	temperate	Southwest Pacific		x
Scorpaeniformes	Scorpaenidae	*Dendrochirus* spp.				x
		Pterois antennata	tropical, reef-associated	Indo-Pacific	1	
		Pterois spp.				x
Perciformes	Serranidae	*Pseudanthias* spp.				x
	Pseudochromidae	*Pseudochromis fuscus*	tropical, reef-associated	Indo-Pacific	1	
	Apogonindae	*Pterapogon kauderni*	tropical	Western Central Pacific	10	
		Sphaeramia nematoptera	tropical, reef-associated	Western Pacific	3	
	Chaetodontidae	*Chaetodon* spp.				x
		Chelmon rostratus	tropical, reef-associated	Western Pacific		x
		Forcipiger longirostris	tropical, reef-associated	Indo-Pacific		x
		Heniochus spp.				x
	Pomacanthidae	*Holacanthus* spp.				x
		Pomacanthus spp.				x
		Pygoplites diacanthus	tropical, reef-associated	Indo-Pacific		x
	Pomacentridae	*Amphiprion clarkii*	tropical, reef-associated	Indo-West Pacific	2	
		Amphiprion ocellaris	tropical, reef-associated	Indo-West Pacific	65	
		Amphiprion spp.				x
		Centropyge bispinosus	tropical, reef-associated	Indo-Pacific	1	
		Centropyge spp.				x
		Chrysiptera spp.				x
		Dascyllus aruanus	tropical, reef-associated	Indo-West Pacific	1	
		Dascyllus spp.				x
		Euxiphipops xanthometapon	tropical, reef-associated	Indo-Pacific		x
		Euxiphipops spp.				x
		Pomacentrus spp.				x
	Cirrhitidae	*Oxycirrhites typus*	tropical, reef-associated	Indo-Pacific	1	
	Labridae	*Coris* spp.				x
		Halichoeres spp.				x

Order	Family	Species	Habitat	Distribution	Number of individuals "Atlanterhavs-parken"	Bergen Aquarium
		Pseudocheilinus hexataenia	tropical, reef-associated	Indo-Pacific	1	
	Blenniidae	*Salarias fasciatus*	tropical, reef-associated	Indo-Pacific	1	
		Salarias sp.				x
	Callionymidae	*Synchiropus* sp.			4	
	Gobiidae	*Gobiodon okinawae*	tropical, reef-associated	Western Pacific	1	
		Gobiosoma oceanops	subtropical, reef-associated	Western Central Atlantic	1	
	Ptereleotridae	*Nemateleotris magnifica*	tropical, reef-associated	Indo-Pacific	2	
	Siganidae	*Siganus magnificus*	tropical, reef-associated	Eastern Indian Ocean	1	
		Siganus spp.				x
	Acanthuridae	*Acanthurus sohal*	tropical, reef-associated	Indian Ocean	1	
		Acanthurus tristis	tropical, reef-associated	Indian Ocean	1	
		Acanthurus spp.				x
		Ctenochaetus tominiensis	tropical, reef-associated	Western Central Pacific	1	
		Ctenochaetus spp.				x
		Naso lituratus	tropical, reef-associated	Pacific Ocean	1	
		Naso spp.				x
		Paracanthurus hepatus	tropical, reef-associated	Indo-Pacific	3	x
		Zebrasoma flavescens	tropical, reef-associated	Pacific Ocean	3	
		Zebrasoma scopas	tropical, reef-associated	Indo-Pacific	1	
		Zebrasoma veliferum	tropical, reef-associated	Western Indian Ocean	1	
		Zebrasoma spp.				x
Tetraodontiformes	Balistidae	*Pseudobalistes fuscus*	tropical, reef-associated	Indo-Pacific	1	
		Rhinecanthus aculeatus	tropical, reef-associated	Indo-Pacific	1	
	Ostraciidae	*Ostracion cubicus*	tropical, reef-associated	Southeast Atlantic, Indo-Pacific		x
		Ostracion meleagris	tropical, reef-associated	Indo-Pacific		x
		Tetrasomus gibbosus	tropical, reef-associated	Indo-West Pacific		x

Alien species in Norway – with the Norwegian Black List 2012 presents an overview of ecological impact assessments of alien species which reproduce in Norwegian territories. The assessments are based upon a new and semi-quantitative set of criteria, where the species' invasion potential and ecological effect are considered. The work has been carried out by 11 groups of experts who have treated ca. 2500 species. Impact assessments have been made for 1180 alien species which reproduce in Norwegian territories and for 134 species which might arrive in Norway with the aid of humans in the future – so called 'door knockers'. A total of 106 species are categorised as having a severe impact, 111 species as having a high impact, 198 species as having a potentially high impact, 399 species as having a low impact, and 366 species as having no known impact in Norwegian nature. In addition, species information has been gathered for 1071 alien species which do not reproduce on the Norwegian mainland and territorial waters, and 69 non-reproducing alien species observed in Svalbard.

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