



## Control of Invasive Species

This Factsheet:

- Outlines the differences between invasive species, non-native and native species.
- Outlines the issues for biodiversity and economics caused by invasive species.
- Highlights specific examples of world-wide invasive species.
- Describes the intervention mechanisms used to control the spread of invasive species.
- Describes a number of invasive species relevant to Britain.
- Discusses the effectiveness of intervention measures in controlling these British invasive species.

- The disruption of habitats, ecosystems and food webs
- Predation of native species
- Out-competing native species
- The spread of disease
- Increasing hybrids and reducing genetic variability
- Human health problems
- Blocked water channels and flooding
- Significant economic costs

### Introduction

Since the last glacial period ended about 10,000 years ago, species introduced into Britain are described as **non-native** (or **alien**). Species present before this period are described as **native**. Some of the non-native species have been brought about accidentally. Other species were brought deliberately. For example, Japanese Knotweed *Fallopia japonica* was brought over by Victorian gardeners as an ornamental plant. This species has now spread rapidly. Controlling it costs the British economy about £166 million a year. A minority of these non-native species are defined as **invasive** since they can damage the environment. Such negative effects include:

**Exam Hint:** Latin names of species are **binomial**. They contain two names. The first is the genus name and it always has a capital letter. The species name is not capitalised. For example:

Genus – *Homo*

Species – *sapiens*

*Homo sapiens* – present day human.

In typed text the Latin name will always appear in italics.

In written text, each name should be underlined separately.

**Table 1** Worldwide examples of invasive species and the problems they bring

Invasive species	Reason for introduction	Impact on the environment
<b>American mink</b> <i>Neovison vison</i> Introduced to the UK and other parts of Europe from the U.S. 	To be farmed for their fur for the fashion industry. The last British fur farm closed in 2003.	A number of mink escaped from the farms into the environment. Mink preyed on the endangered Water Vole <i>Arvicola amphibious</i> and ground nesting birds. The more aggressive American mink threatens to drive the European species towards extinction. The American mink also feeds on poultry and salmon from fish farms.
<b>Cane toad</b> <i>Rhinella marina</i> Introduced to Australia from Hawaii. 	As a method of <b>biological control</b> to regulate the numbers of the Sugar Cane Beetle. This beetle is an economic crop pest.	Huge loss of biodiversity. The cane toad has had very little impact on the pest beetle. The toad feeds on species which are easier to catch. It produces a harmful toxin against potential predators like the Northern Quoll <i>Dasyurus hallucatus</i> . This marsupial is now on the IUCN red list of endangered species. Steps taken to protect this species include subjecting young quolls to non-fatal levels of the toxin so they learn to avoid the toad in future.
<b>Rats and Domestic Cats</b> Introduced to Ascension Island from parts of the mainland.	Rats accidentally found their way onto supply ships. Cats were then introduced to control the rat population.	Loss of large numbers of breeding Sooty Terns <i>Onychoprion fuscatus</i> and other seabirds. Since these seabirds have had no natural predators they do not try to escape. Introduced rats and cats have plentiful supplies of eggs, chicks and adult birds for food. The cat numbers have been reduced by poisoning. The rats remain.

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**Methods of Controlling Invasive Species**

Methods of control do not always wipe out the invasive species. This is because the necessary steps are:

- Often very expensive
- Labour intensive
- Unlikely to destroy all of the individual organisms present in an area

The control mechanisms have to be based on effectively managing the threat and keeping it at a sustainable level. Sometimes it is accepted that the problem is here to stay but it must be controlled.

Precautionary measures to control invasive species are taken to try to reduce the threat to our biodiversity. These are **biosecurity** measures and they include:

- **Prevention.** The European Union's Invasive Alien Species Regulation (January 2015) ensures that, for the most invasive and threatening species, an EU-wide approach prevents their entry and spread.
- **Early detection.** This involves a systematic process. It identifies threats from invasive, non-native species which are not yet established in Britain. This is known as **Horizon Scanning**.
- **Long-term management and control.** These include the use of herbicides, plant/seed removal, poison, trapping, shooting and **biological control**.
- **Research and education.** These use public awareness campaigns like 'Be Plant Wise'. The 'Check, Clean, Dry' campaign for boat and kayak users helps prevent the spread of Zebra mussels. Such steps increase biosecurity. They reduce the spread of invasive species or prevent the introduction of new kinds.

**Exam Hint: Biodiversity** includes aspects of **species diversity** and **genetic diversity**. **Species diversity** refers to the number of species present, also called **species richness**. It also refers to the abundance of the different species. This is called **species evenness**. The greater the number of species and the more evenly distributed the numbers of each species, increases the biodiversity. **Genetic diversity** is assessed by examining how much the **alleles** within a single species differ. **Alleles** are different forms of the same gene.

**Invasive Species in the UK****Grey Squirrel *Sciurus carolinensis***

Grey squirrels were introduced into Britain from America in the mid-nineteenth century. Where the greys co-exist with the native red squirrel *Sciurus vulgaris*, this can lead to the extinction of the **native** species. This is due to **competition** and the squirrel pox virus. This virus is carried by the grey squirrels and does not kill them. It is fatal to the red squirrels. By 1938, it was declared illegal to import grey squirrels into Britain

**Figure 1** A grey squirrel

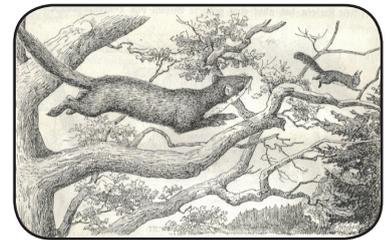
but, by then, they were very well established. Red squirrel numbers have dropped dramatically in recent decades. Grey squirrels remain one of the most commonly spotted British mammals. However, they cause problems:

- **Economically**, they damage trees by stripping bark, causing damage to fruit and nuts.
- **Socially**, they can divide opinion in parks and gardens where they often take food put out for bird species.

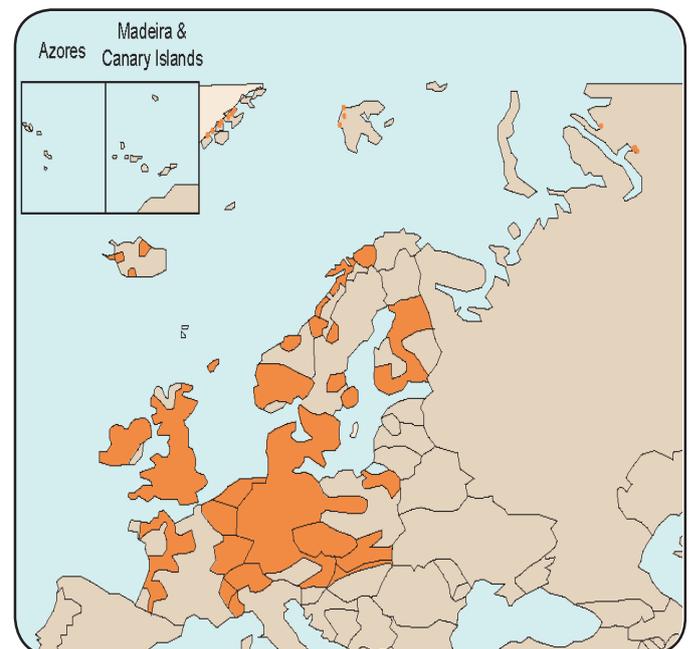
Methods used to control the grey populations include:

- The use of baited food that disrupts their fertility
- Protecting the habitats of the red squirrel
- In parts of Scotland,

encouraging the increase of the Pine Marten *Martes martes*. The pine marten preys more on the grey squirrel. This is because since the more agile red can escape onto the thinnest branches of conifer trees.

**Figure 2** Pine Marten predation of a grey squirrel**Giant Hogweed *Heracleum mantegazzianum***

Giant Hogweed was introduced in 1817 when it was planted as an ornamental species in Kew Gardens. The species forms very tall and dense stands up to five metres high. This greatly reduces species diversity through competition for light, water and nutrients. The plant is native to the Caucasus region of Europe (South West Russia and Georgia) but is now very common alongside riverbanks in Britain. The plant's sap is toxic and can burn human skin. This causes problems when trying to remove the plant. Each plant can produce 20,000 seeds which can be accidentally spread when humans attempt to remove the plants. The control of Hogweed is largely one of management rather than eradication.

**Figure 3** The distribution of Giant Hogweed into non-native parts of Europe by 2005

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**Figure 4** Treating Giant Hogweed**Ruddy duck** *Oxyura jamaicensis*

The Ruddy duck was introduced to Britain from the U.S. by wildfowl collectors. It began to spread rapidly by the 1940s as birds escaped and increased in number. By the early 1990s this invasive duck reached areas of Spain. The Ruddy duck was able to breed with the White-Headed duck forming a **hybrid** of the two ducks. This diluted the genetic diversity of the endangered White-Headed duck. In 2005, a number of bodies including the UK government and the RSPB oversaw an eradication programme. The Ruddy duck has virtually been removed from Britain and there are no longer reports of hybrids in Spain. The methods of **culling** the Ruddy ducks include:

- Shooting
- Dipping eggs in liquid paraffin to prevent them from hatching
- Trapping females in the nest for humane dispatch

The total cost has been estimated at over £5 million pounds but does appear to have been successful.

The successful culling of the Ruddy duck shows that eradication of an invasive species can be achieved. However, the issues are controversial. There are economic considerations and the ethical elements of the culling process. Future invasions will no doubt occur. It remains to be seen how effectively scientists and governments can tackle future aliens and keep on top of existing issues.

**Figure 5** A male Ruddy duck**Glossary of terms**

**Biological control:** The use of a natural enemy or predator to control an invasive non-native species.

**Biosecurity:** A strategic and integrated multi-agency approach aimed at preventing the spread of harmful organisms.

**Culling:** Reducing the size of animal populations often through the killing of a selection of the population (e.g. pregnant females).

**Horizon scanning:** A systematic process used to identify future threats from invasive, non-native species not already established in Britain.

**Questions**

1. Fill in the gaps with the most appropriate term from the list below. (10)

outcompetes alien genetic dense extinct

invasive shooting hybrids biological predators

Non-native species are also referred to as \_\_\_\_\_. Such species which cause harm to the environment are known as \_\_\_\_\_. Non-native species are often introduced as \_\_\_\_\_ of a native pest species. This is known as \_\_\_\_\_ control. Giant Hogweed often \_\_\_\_\_ other plants as its \_\_\_\_\_ foliage often blocks sunlight from reaching them. The Ruddy duck and White-Headed duck can cross breed to form \_\_\_\_\_. A decrease in the \_\_\_\_\_ diversity of the White-Headed duck makes them more likely to become \_\_\_\_\_. Measures taken to control non-native animals can include \_\_\_\_\_ and poisoning.

2. a. Explain what is meant by the term biodiversity. (2)  
b. Outline the importance of maintaining biodiversity. (4)
3. Define what is meant by the term *species*. (2)
4. State reasons **for** and **against** the *culling* of animals. (4)

**Answers**

1. Non-native species are also referred to as **alien**. Such species which cause harm to the environment are known as **invasive**. Non-native species are often introduced as **predators** of a native pest species. This is known as **biological** control. Giant Hogweed often **outcompetes** other plants as its **dense** foliage often blocks sunlight from reaching them. The Ruddy duck and White-Headed duck can cross breed to form **hybrids**. A decrease in the **genetic** diversity of the White-Headed duck makes them more likely to become **extinct**. Measures taken to control non-native animals can include **shooting** and poisoning.
2. a. Total number of all the different species; Genetic diversity of species.  
b. Eco-tourism; Economic benefits; Food for humans; Resources/species may have future use (e.g. medicine); Maintains food web/food chains; Genetic variation.
3. Reproduce, to produce fertile offspring; Occupy similar niche; Possess similar features, physiology and behaviour.
4. For: To prevent the spread of invasive species;  
To prevent native species from becoming a pest (e.g. Red Deer in gardens or damaging tree saplings);  
To protect native species from being outcompeted;  
To maintain biodiversity.
- Against: Ethical arguments about killing animals;  
Use of poisons may lead to build up in the ecosystem;  
Use of poisons may affect non-target organisms.

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