

Case study: Are aliens a bad thing?

Introduction

This activity is about the effects of alien species on ecosystems. It is similar in style to the Unit 4 assessment and is designed to help students prepare for this.

Students will receive the sources about 6 weeks before the real exam to allow them time to read and understand them. In the exam they will receive one more short source, similar to Source E in this activity and will have one hour and thirty minutes to answer the questions. They may well need longer for this activity as they may have had less time to become familiar with the sources. Some questions could be left out.

Resources

Source A: BBC news article 'Alien invasion hits the UK'
<http://news.bbc.co.uk/1/hi/sci/tech/7531575.stm>

Source B: A New Scientists article about the DAISIE project for cataloguing invasive species
<http://www.newscientist.com/article/dn13284>

Source C: An article from PLOS Biology about the reasons behind the DAISIE project.
<http://biology.plosjournals.org/perlserv/?request=get-document&doi=10.1371/journal.pbio.0040279>

Source D: A Parliamentary Office of Science and Technology Report on Invasive Species.
<http://www.parliament.uk/business/publications/research/p-ost/>

Source E: A New Scientist article about the need to move species affected by climate change
<http://www.newscientist.com/article/dn14357-threatened-species-need-help-finding-cooler-homes.html>

How Science Works

Ag Data can be presented and analysed in a variety of formats including graphs with linear and logarithmic scales.

Ai Identifying and classifying living things is fundamental to understanding their variety. Scientists make, preserve and study collections of specimens as a valuable source of information which can help to answer important questions. The same set of objects can always be classified in different ways; the classification used will depend on the purpose of classifying, and is often based on underlying theoretical ideas about the objects.

Eg The desire to be first to a new discovery or breakthrough is a powerful motivation for scientists, and can lead to competition. Much scientific work, however, nowadays involves collaboration, in large interdisciplinary teams, often from several countries. This is particularly common where the work requires expensive equipment or the collection and processing of very large amounts of data.

Science explanations

Pa Biodiversity describes the whole variety of life on Earth. It includes the differences between species of plants and animals, but also their genetic variation within species, and the variety of ecosystems of which they are part.

Pb Classifying living things helps to identify relationships between and within species, and to decide how best to protect the individual species that are part of the world's biodiversity.

Pc New DNA technologies are changing the scientific approach to classification.

Part A

1. This question is about **Sources A and B**

(a) What is the difference between alien species and invaders, also known as invasive species? (You may also find source D, Background section helpful for this)

- *Alien species are all those species not originally from a particular area.*
- *Invaders are alien species which successfully compete with native species, and take over niches, altering the ecosystem. Invasive species are those which cause harm to the environment, human health or the economy.*

(2 marks)

(b) Describe three different ways in which alien species have been introduced into Europe

- *transport, truck, car, plane, ship*
- *escaped pets*
- *intentional to control pests like Harlequin ladybird*
- *canals*

(3 marks)

(c) Give three specific examples of harm caused by invasive alien species in Europe.

- *grey squirrels cause collapse of red population*
- *Japanese knotweed/ floating pennywort blocks rivers causing flooding*
- *human health problems/blisters/asthma from giant hogweed/oak processionary moth/ poisonous pufferfish*
- *decrease in apple yield Harlequin ladybirds feed on fruit*
- *giant nomadic jellyfish affect fishing*

(3 marks)

total 8 marks

2. This question is about **Source C**.

(a) Source C uses the number of publications in scientific journals, shown in Figure 1, as an indicator of interest in the topic of alien species. Suggest why it is reasonable to assume that this is a valid indicator of interest.

- *Social influences affect direction of scientific work*
- *Social priorities affect funding for research influence funding available (Fa)*

(2 marks)

(b) DAISIE is an international project. Why has taxonomy, the classification of species, been an important part of its work?

- *Important to have an internationally agreed system for classifying species (Ai)*
- *problem species can then be monitored/ identified internationally and dealt with*
- *The DAISIE project coordinates information about current and potential invader species making it available free on the internet (Ec)*
- *allows faster and more coordinated action.*

(3 marks)

(c) Discuss why international collaboration on invasive species, like DAISIE, is so important.

- *invasives can cross national boundaries along with freight or people*
- *once established some species can spread rapidly*
- *shared information monitors spread/ provides early warning*
- *no country can control on its own*
- *not all countries have good data or experts on invasive species*
- *international collaboration can provide expertise*
- *shared information on effective treatments*
- *large numbers of experts allow 'collection and processing of large amounts of data' (Eg)*

(4 marks)

(d) Why might it be hard to agree on criteria for which species should go on the '100 worst alien species list'?

- *future effects uncertain (He)*
- *hard to balance effects on biodiversity and on human health*
- *hard to balance effects on different human groups/ or regions of Europe (Hj)*
- *hard to balance highly visible species against invertebrates*

(2 marks)

total 11 marks

3. This question is about **Source D**.

(a) Public opinion and public support for specific control and eradication measures is mentioned several times in Box 5. Discuss why the writer considers that public support is important in this context.

- *MPs need votes, they must not do unpopular things*
- *measures cost taxpayers money*
- *public opinion influences decision makers*
- *pressure groups may act on actions that appear superficially cruel such as killing squirrels (Hf)*
- *pressure groups can have significant influence often through use of media/ media may amplify public opinion*

(4 marks)

(b) In any policy decision cost-benefit analysis may be relevant.

(i) give one example of an economic cost and one of an ecological cost of invasive non-native species.

economic

- *research into control of Japanese knotweed*
- *destruction of Japanese knotweed*
- *removal of rhododendron*
- *controlling oak moth*

ecological

- *grey squirrel out competing red squirrel*
- *tree disease near rhododendron*
- *mink killing water voles*

(2 marks)

(ii) How much weight do you think should be given to the probable costs to the Ornamental and Aquatics Trade (page 3).

- *OATA suggests that it would lose between £2 and £5 million*
- *costs of eradication are far higher/ £2 billion per year*
- *e.g. Japanese knotweed £1.56 billion/ rhododendron about £10million per region*
- *biodiversity more important than one small industry*
- *only about 15% aliens are invasive so hard to quantify effect*
- *hard to put cash value on biodiversity (Hb)*

(2 marks)

(c) There are a range of international agreements and British Laws covering the control of non-native species described on page 2. Choose one of these and use evidence from the rest of the report to assess how effective it has been in reducing the risks of invasive species.

- *Most evidence points to failure of control*
- *Choice of any evidence relevant to agreement or law.*

(2 marks)

total 10 marks

4. This question is about the impact of climate change on the problems of invasive non-native species . You may find **Source E** useful.

(a) Climate change is expected to have an effect on ecosystems in Europe. Explain why climate change may affect the balance between native and non-native species.

- *changing conditions/temperature/water will reduce competitiveness of a native species*
- *may give advantage to a non-native species allowing it to become invasive*
- *species may move range in response to changing conditions*
- *they will become aliens in their new habitat*

(3 marks)

(b) Source E is about the policy of moving species endangered by climate change to new regions. Scientists both in favour and against the policy are quoted. Summarise both points of view as described in Source E.

In favour

- *some species cannot move on their own, mountains/ cities restrict*
- *need to save as many functioning species as possible*
- *plan may be to move whole ecosystem*

Against

- *creates problem of alien species which may be invasive*
- *there are always some species already in the land*
- *climate change not main threat to biodiversity*
- *need to understand threat better before acting*

(4marks)

total 7 marks

(36 marks)**Section B**

- Answer both of Questions 5 and 6 in the answer book provided.
 - Use **Sources A to E** to provide examples and evidence for your argument.
 - This section is worth 24 marks
 - Some of the marks will be awarded for your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate.
5. Choose one of the alien species affecting the UK that are mentioned in any of the sources. Write a public information leaflet explaining what the public can do to help reduce the impact of this species and why this is important. Suggest where the leaflet should be distributed, according to the particular species you have chosen.

Use the level descriptors below to mark.

(12 marks)

6. Read Source E

You are a newly appointed civil servant working for the Department for Environment, Food and Rural Affairs. Your first task in your new job is to write a paper commenting on a colleague's suggested policy statement relating to invasive species and climate change.

Her statement says that natural or assisted species relocation and habitat mitigation in response to climate change should be allowed for all native species within the land mass of England and Scotland. Any species non-native to the island should be treated as a potential invasive alien.

Your report should not exceed 400 words.

The argument could include the following points:

Species that are moved, or which move of their own accord due to global warming can potentially be as invasive to a new environment as species introduced from another country.

Some supported relocation should be carried out to allow species that would otherwise become extinct through lack of suitable habitat or climate change.

Not allowing natural movement of species as global warming occurs will result in wasted money and resources, as changes in the nature and location of habitats is inevitable.

Non-natives that are not currently invasive could become so under climate change

Decisions about natural or assisted relocation from across the channel must take into account the potential invasiveness of the species in the UK environment. Proper monitoring and precautions should be taken, bearing in mind that only 10% of alien species are invasive.

Habitat mitigation could help balance habitat losses due to global warming, but should be accompanied by workable legislation that effectively balances costs and benefits to humans and biodiversity.

(12 marks)**(24 marks)**

A2 Science in Society - Level descriptors for 12 mark questions

The marking scheme for this section includes an overall assessment for the quality of written communication. There are no discrete marks for the assessment of written communication but quality of written communication will be one of the criteria used to assign the answer to one of four levels. Marks are assigned according to level descriptors.

Candidates would be expected to achieve at least 3 of the 6 descriptors to be awarded marks at that level. Not all descriptors are relevant to each answer.

The marks awarded within the range depend on the extent to which candidates have met the criteria for that range and also on guidance relevant to the specific question

level of response	descriptors:	mark range
good level 4	<ul style="list-style-type: none"> clear exposition of science explanations relevant to the issue; appropriate and effective use of the relevant ideas about how science works; good overall grasp of the range and nature of the issue(s); interprets arguments presented, recognising evidence, claim and counterclaim; writes well structured argument using a range of evidence to reach a reliable conclusion, includes counter-argument; fluency and accuracy of expression, with only minor errors of grammar, punctuation or spelling. 	10-12
competent level 3	<ul style="list-style-type: none"> good attempt at exposition of science explanations; use of some relevant ideas about how science works; general grasp of the range and nature of issue(s); interprets arguments presented, recognising some of the main components writes structured argument using some evidence to reach a conclusion; accuracy of expression, with some errors of grammar punctuation or spelling 	7-9
limited level 2	<ul style="list-style-type: none"> exposition of science explanation minimal or inaccurate minimal use of ideas about how science works; grasp of some features of the issue(s); interprets only part of arguments presented arguments presented but with weak structure and/or minimal evidence accuracy of expression, but with serious errors of grammar punctuation or spelling 	4-6
inadequate level 1	<ul style="list-style-type: none"> exposition of science explanation confused use of ideas about how science works absent or wrong appears not to understand the issue; cannot interpret the argument presented argument presented as just a claim with no structure or evidence expression unclear with serious errors of grammar punctuation or spelling 	1-3
0	incorrect or no response	0
		Total 12

June 2009



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<http://biology.plosjournals.org/perlserv/?request=get-document&doi=10.1371/journal.pbio.0040279>

Source D: A Parliamentary Office of Science and Technology Report on Invasive Species.

<http://www.parliament.uk/documents/upload/postpn303.pdf>

Source E: A New Scientist article about the need to move species affected by climate change

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Part A

1. This question is about **Sources A and B**

(a) What is the difference between alien species and invaders, also known as invasive species? (You may also find source D, Background section helpful for this)

(2 marks)

(b) Describe three different ways in which alien species have been introduced into Europe

(3 marks)

(c) Give three specific examples of harm caused by invasive alien species in Europe.

(3 marks)

total 8 marks

2. This question is about **Source C**.

(a) Source C uses the number of publications in scientific journals, shown in Figure 1, as an indicator of interest in the topic of alien species. Suggest why it is reasonable to assume that this is a valid indicator of interest.

(2 marks)

(b) DAISIE is an international project. Why has taxonomy, the classification of species, been an important part of its work?

(3 marks)

(c) Discuss why international collaboration on invasive species, like DAISIE, is so important.

(4 marks)

(d) Why might it be hard to agree on criteria for which species should go on the '100 worst alien species list'?

(2 marks)

total 11 marks

3. This question is about **Source D**.

(a) Public opinion and public support for specific control and eradication measures is mentioned several times in Box 5. Discuss why the writer considers that public support is important in this context.

(4 marks)

(b) In any policy decision cost-benefit analysis may be relevant.

(i) Give one example of an economic cost and one of an ecological cost of invasive non-native species.

(2 marks)

(ii) How much weight do you think should be given to the probable costs to the Ornamental and Aquatics Trade? (page 3).

(2 marks)

(c) There are a range of international agreements and British Laws covering the control of non-native species described on page 2. Choose one of these and use evidence from the rest of the report to assess how effective it has been in reducing the risks of invasive species.

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total 10 marks

4. This question is about the impact of climate change on the problems of invasive non-native species. You may find **Source E** useful.

(a) Climate change is expected to have an effect on ecosystems in Europe. Explain why climate change may affect the balance between native and non-native species.

(3 marks)

(b) Source E is about the policy of moving species endangered by climate change to new regions.

Scientists both in favour and against the policy are quoted. Summarise both points of view as described in Source E.

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(36 marks)

Section B

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(12 marks)

6. This particularly relates to issues discussed in **Source E** but you may need to use ideas from the other sources.

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(12 marks)

(24 marks)