

# Unnatural selection

Teacher resources contents page



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## Hint:

If you print out pages 2 – 8 of this document double sided there will be one section per sheet of paper.



# Unnatural selection

## *Aims and objectives*



## Introduction

The introduction of non native species into the environment is a phenomenon which has taken place for centuries. Species are introduced intentionally for food, resources, leisure, aesthetics and biological control. Other non native species are unintentionally introduced through trade and travel. In some cases introductions can result in severe consequences on the environment, biodiversity and ecosystem balance.

In this activity students will role play a local authority and will have to decide whether to accept a planning application to build a Salmon farm. Students will discuss and consider the economic, social and environmental implications of the Salmon farming industry.

Students will consider these issues using a mixture of structured group and class discussion.

All the resources required to run this activity are downloadable from the Question of Taste website, they include:

1. Teacher resources
  - Aims and objectives sheet (this sheet) – Includes an introduction to the resources learning outcomes and curriculum links
  - Lesson plan – Instructions and advice on one way to use the resources
  - Background information – Includes some background information on the topic covered and links to further reading
2. Power point presentation – Can be used by teachers to introduce the topic and structure the lesson
3. Student resources
  - Stakeholder cards – A selection of cards written to stimulate debate
  - Support and against cards
  - Case studies
  - Salmon farm information
  - Report sheet

## Learning Outcomes

### Knowledge and understanding

- Students will be able to define what is an introduced species
- Students will identify the economic, social and environmental implications of introduced species
- Students will understand how human behaviour can significantly change the natural environment.

### Attitudes and values

- Students will develop their own opinions regarding the balance of positive and negative implications of introduced species
- Students will empathise with different stakeholder opinions

### Skills

- Students will develop speaking and listening skills through discussing the issues
- Students will develop their social skills through working as a group to generate ideas
- Students will develop the ability to reach a group consensus
- Students will develop summarising skills when asked to feedback to the class
- Students will develop analytical skills in assessing evidence before them.



## National Curriculum links

### AQA

Biology

3.4 Populations and environment

- 3.4.1 The dynamic equilibrium of populations is affected by a number of factors

General Studies

3.1 Thinking, analytical and communication skills

Critical Thinking

3.1 Critical thinking foundation unit

- 3.1.1d Dialogue

Geography

Unit 2 Contemporary geographical issues

- The relationships between human activity, biodiversity and sustainability

Environmental Studies

Unit 4 Biological resources and sustainability

- 3.4.3 Aquatic food production systems

### OCR

Biology

3.2 Molecules, biodiversity, food and health

- 2.3.1 Biodiversity
- 2.3.3 Evolution

Geography

A2 Unit Global issues

- Ecosystems and environments under threat
- Economic issues

General Studies

3.4 Thinking and analytical skills

### Edexcel

Biology

Unit 2 Development, plants and the environment

- 2.4 Biodiversity and natural resources

Geography

Unit 3 Contested planet

- Topic 3 Biodiversity under threat

General Studies

Unit 4 Beliefs, values and responsibilities

- 4.5 How do we decide what is right or wrong?

## Introduction

Students will work in groups and role play a local authority discussing the positive and negative implications of salmon farms in Scotland. The students will use stakeholder opinions, case studies and background information of Salmon farms to make an informed decision.

## Equipment list

- Blue stakeholder cards, one set per group
- Green case study cards, one set per group
- Salmon farm background information, one per group
- Report, one per group
- Pens, pencils, paper or post it notes
- Background notes and presentation for teacher to introduce activity
- Flip chart or white board

## Instructions

Introduction (10 minutes)

- Introduce the topic via the background notes and presentation (notes available on presentation)
- Divide the class into groups of 5 or 6

Task 1 (5 minutes)

Role play local authority

- Read the statement on slide 6 to the students
- Read Salmon farm background to the students on slide 7
- Read the task to the students on slide 8
- Give each group of students a copy of salmon farm background information to read (student resources)
- Each group of students have to discuss and decide which stakeholders they would consult to inform them about salmon farms
- Give the students paper or post it notes to record the stakeholders they would question

Task 2 (20 minutes)

- Read task 2 out on slide 9
- Hand out stakeholder opinion cards and support/against cards
- Ask the students to place the support and against cards at either end of the table
- Students will decide whether each stakeholder opinion supports the planning application to build a salmon farm or not
- Students will place the stakeholder cards towards support or against depending on what they decide
- Some stakeholders will fall in the middle so there should be a range between support and against.
- Students can include stakeholders from task 1 which are not included in the stakeholder opinion cards
- Students will consider the opinions and discuss why the stakeholders support the salmon farm or not

### Task 3 (10 minutes)

- Read the task out on slide 10
- Ask the students to come to a decision as to whether they would support the planning application to build a salmon farm or not
- To inform their decision further hand out the green case study cards
- The case study cards give the students other examples of introduced species
- Hand out the report sheet and ask the students to complete the report
- The report will ask the students for their decision, if they have any recommendations and what extra information they would need to inform their decision further

### Feedback (10 minutes)

- Ask each group if they would approve or reject the planning application to build a salmon farm giving explanations for their decision
- Ask the students if they have any suggestions or recommendations towards the development of salmon farms referring to their report
- Finally discuss with the students what other information they would have liked to receive to inform their decision further

### Extension activity

- 10 students role play the stakeholders (orange stakeholder opinion cards will inform the students of their position towards the salmon farms)
- In task 2 the students role playing the local authorities can question the stakeholders in an interview or court room setting
- The interviews can help further inform the decision of the groups
- Students will come up with their own stakeholders then research their positions before using this information to come to a decision.

## Introduced species

Below is some information on what constitutes an introduced species and how they can impact on an environment,

What is an introduced species?

- An introduced species can be defined as a species which has become introduced and established by human activity into an ecosystem outside of its native geographical range
- Introduced species can be referred to as non native, invasive, alien, non indigenous or exotic species

Cultivated and established introduced species

- Some introduced species only exist due to human cultivation and domestication such as certain crops and cattle
- Other species may become established and reproduce in the environment without continued human assistance

What is are invasive species?

- Invasive species are non native species that spread quickly and cause negative impacts upon the environment and biodiversity including harm to human resources, agriculture and urban environments
- A small percentage of introduced non native species will have a severe impact on their new environment
- This impact can influence biodiversity and natural selection
- Invasive species can be detrimental if they out compete or predate native biodiversity or reproduce uncontrollably due to a lack of natural predators

Why are species introduced into new environments?

- Humans have been introducing species into new environments for thousands of years
- Humans introduce species for food, resources, leisure and aesthetics
- Many species are unintentionally introduced through trade, travel and escapes
- Not all introduced species will negatively affect biodiversity and natural selection. Some can even be beneficial

Natural migration

- Species naturally migrate over long periods of time into new environments
- With such a long time scale an ecosystem will be able to adjust and incorporate the new species

Impact of introduced species

- Non native species can be problematic due to the rate at which humans introduce species into a new environment
- Introduced species can have a high economic value and thus governments may be less inclined to mitigate environmental impacts
- Introduced species may have unpredictable effects upon the environment which may be costly and take decades to resolve

## Examples of unpredictable impact from introduced species

Below are two specific examples of introduced species that have had unpredictable impacts

### Arctic fox

- A species of arctic fox was introduced onto the Aleutian island's archipelago in the 18<sup>th</sup> century for the fur trade
- The islands have nutrient poor soils but are covered in rich grasslands
- The islands are inhabited by ground nesting seabirds
- The grasslands can exist because the ground nesting birds provide the soil with rich nutrients via their guano
- The arrival of the arctic fox led to the predation of the sea birds and a dramatic decrease in their population
- The direct impact was a decline in the seabirds but the indirect effect was a change in the ecosystem from rich grassland to tundra
- This occurred because the decimated sea bird populations were no longer providing the poor soil with nutrient rich guano
- This indirect effect was completely unpredictable and resulted in severe ecosystem decline
- The majority of the foxes have now been removed from the Aleutian Islands and the seabirds are beginning to return. This has seen the lush vegetation returning also on islands where the seabirds are colonising.
- Experts believe it will take decades for the ecosystems to fully recover

### Salmon Farms

- Salmon farms in Scotland produce 100,000 tonnes of salmon a year
- The UN has suggested aquaculture is the only feasible way to reach global demand for sea food.
- Salmon farming in Scotland is continuing to grow and injects £500 million into the UK economy each year
- Salmon farming has huge benefits to the local rural economies in Scotland. £39 million is injected into local salaries each year in Scotland. Local suppliers also benefit from salmon farming in Scotland
- Whilst salmon farming has huge economic value many environmental impacts have been identified
- The intensive nature of salmon farming produces large amounts of pollution which can have detrimental effects upon the local biodiversity
- Escapes from farmed fish can interbreed with wild salmon reducing the fitness of the wild stock
- Disease can spread from the farmed fish to wild Salmon most noticeably parasitic sea lice which can prove fatal for juvenile wild Salmon

## Further reading

- Scottish Salmon Producers Organization  
<http://www.scottishsalmon.co.uk>
- Review of Potential Impacts of Atlantic Salmon Culture on other Salmon Evolutionarily Significant Units  
<http://www.thefishsite.com/articles/40/review-of-potential-impacts-of-atlantic-salmon-culture-on-other-salmon-evolutionarily-significant-units>
- Conifer Plantations, Dumfries & Galloway  
<http://www.dumgal.gov.uk/CHttpHandler.ashx?id=2737&p=0>
- GB non-native species secretariat  
<http://www.nonnativespecies.org/>
- Forestry Commission  
<http://www.forestresearch.gov.uk/fr/INFD-6XPC8D>
- Introduced Foxes Transformed Vegetation on the Aleutian Islands from Lush Grassland to Tundra  
<http://soundwaves.usgs.gov/2005/05/research.html>
- Monterey Pine  
[http://plants.usda.gov/plantguide/doc/cs\\_pira2.doc](http://plants.usda.gov/plantguide/doc/cs_pira2.doc)  
[http://www.coilltenurseries.ie/notes/monteray\\_pine.pdf](http://www.coilltenurseries.ie/notes/monteray_pine.pdf)