



## Lesson plan for Interdependence

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### Background (13 minutes)

Following on from the show reel, we are going to look at a particular type of habitat called 'taiga' (Russian for swamp forest). This is an area of northern coniferous forests prone to extreme conditions and the organisms that live there have special adaptations to ensure their survival.

**Link to evolution:** natural selection will have ensured that only the best adapted organisms have made it this far. Those advantageous genes will be passed on to future generations.

### Question

What adaptations do the trees, snowshoe hares and lynxes have to help them survive in these harsh conditions?

#### Pupils will typically answer:

- ◆ The trees have specially thickened bark to help to protect them from forest fires. The pine needles trap incoming radiation, so the temperature inside the forest is greater than outside and has less fluctuation. It also reduces the wind chill factor.
- ◆ Lynxes like dense undercover which is where hares thrive. Hares have a 10-year population cycle (high then low). When the population is low the lynxes don't breed; especially in the first year they have fewer offspring and have a lower survival rate, so don't compete with mature lynx for resources. They have a 60-day gestation.
- ◆ Pupils will describe characteristics that apply to killer cats: specialised carnivorous teeth, sharp claws, great speed, agility, good hearing, camouflage, etc.
- ◆ The hares can breed within hours of giving birth. They produce a new litter in five weeks with a 35-day gestation. Hares are born with their eyes open, fully formed and 'ready to go', unlike rabbits. **Pupils could be asked to hypothesise why this is the case.**
- ◆ Pupils will describe characteristics that apply to hares: adapted hind legs, feet to allow movement through snow, good hearing and other senses, camouflage, etc.

### Responses and summary

These organisms beat all the odds to survive, so must have been naturally selected over other organisms. They need to exist in a delicate balance in order to continue their survival. We will look at which factors affect their survival.

## Warm-up activity (10 minutes)

Activity using a ball of wool and scissors to construct a food web.

### Aims

- ◆ To show that all organisms are interconnected and that a seemingly trivial intervention (environmental/human) could have catastrophic effects for the whole ecosystem. **Link here to real-life situations of the introduction of 'alien' species, e.g. rabbits in Australia and the subsequent use of the myxoma virus to control the population, use of toxic pesticides as pest control, etc.**
- ◆ To show where the Interdependence game fits into a real ecosystem.

### Resources

- ◆ large, coloured ball of wool,
  - ◆ large space free from furniture,
  - ◆ scissors,
  - ◆ labels with pre-printed names of organisms from taiga food web.
1. Pupils are given a label and are shown where they are in the food web (screen/worksheet) and who they are eaten by.
  2. Starting with one producer, the ball of wool is passed to one of its consumers, who in turn passes it to its own consumer until it reaches the end of the food chain. Pupils can then complete the food web themselves with the other organisms.
  3. This will create a huge, messy, interconnected web. It is a great ice breaker.
  4. The teacher can tug gently on the string at one end of the web and ask all those in contact to 'pass it on'. This should ensure that all the connections are made and show how the organisms are intricately interconnected.
  5. The teacher then introduces the removal of small rodents/other suitable organism as pests.

### Questions

Which organisms will be affected? If they die out, they will be unable to support their predators. Predators will need to find alternative prey. What will happen if they are *unsuccessful*? **They will die out or will need to move to a new area.** What will happen if they are *successful*? **They will disrupt another predator-prey relationship, causing the process to continue.**

## Main activity (25 mins)

Demo *Interdependence* game on existing settings. **Note: lynx peaks after hares have already crashed.**

### Questions

Why? If the air became polluted, e.g. after a volcanic eruption, there will be less sunlight. What will happen? Who will die off first and why? **Demo: reduction to 27% sunlight.**

### Running the activity

1. Organise pupils into six groups.
2. Explain that they are on the taiga environmental management board and they have to put in place a strategy to manage the environment skilfully.
3. Give each of the groups one of the following scenarios and tell pupils to choose which values they wish to change, to justify their choice, to predict what pattern they will see in the graph and to present their results to the group.

#### **Too few hares – possible solutions:**

- ◆ Release hares from captive breeding programme
- ◆ Hunt lynxes

#### **Too many Hares – possible solutions:**

- ◆ Release lynxes from captive breeding programme
- ◆ Trap hares
- ◆ Reduce vegetation
- ◆ Introduce another predator of hares, e.g. hawk

4. Input values (teacher or pupils could do this) and observe presentations from groups.
  5. Ask other groups for comments and any changes they might make to improve on the group solutions.
  6. Questions and feedback to the groups.
- ◆ ***Ethical issue: debate the rights and wrongs of human intervention (trapping, hunting) vs natural predation. Explain that there is no such thing as 'blind science' and that all scientists can refuse to participate in research or procedures that they deem to be ethically unsound. They can suggest suitable alternative solutions.***
  - ◆ Another layer of difficulty could be added quite easily by adding a competitive element, e.g. ask pupils to see how many generations they could keep the snowshoe hares and lynxes alive after addition of the hawk. No top-ups are allowed.