Activity 5: consumers

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| VCE key knowledge | * The distribution, density and size of a population of a particular species within an ecosystem and the impacts of factors including available resources, predation, competition, disease, chance environmental events, births, deaths and migration
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| VCE key science skills | * Process quantitative data using appropriate mathematical relationships and units
* Organise, present and interpret data using schematic diagrams and flow charts, tables, bar charts, line graphs, ratios, percentages and calculations of mean
* Access secondary data, including data sourced through the internet that would otherwise be difficult to source as raw or primary data
* Draw conclusions consistent with evidence and relevant to the question under investigation
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| Learning outcomes | * Describe how Ecologists work towards the conservation of species and ecosystems
* Understand how Ecologists conduct a wide range of experiments to learn about the ecosystem
* Compare a wide range of biotic and abiotic factors and explain how they influence the size and distribution of the population of a particular species
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| Duration | 45-60 minutes |

Students explore the next trophic level by looking at native small mammal populations inside and outside the reserve. They interpret raw data to show that small mammal populations are higher in AR and attribute this to the absence of foxes. Students then look at the combined impact of rabbits and drought (as a chance environmental event) have on small mammals. They do this by modelling what would happen in a drought using a series of parameters.

As well as reinforcing concepts of complex interconnected ecosystem dynamics and the impact of chance environmental events, this activity introduces another important tool used by ecologists: ecological modelling.

Students hear from Dr Nicki Munro in three short videos who explains trapping, modelling, and the important role that small native mammals have in the ecosystem.

Students will encounter a key term in this activity and should ensure they have clear definitions written in their notes.

* **Chance environmental events**: *events that change the environment temporarily and influence the survival of species, such as fires, floods and droughts*

# Step 1

First part of worksheet in which students draw a graph from transect data. Short video embedded in worksheet. Students will need one sheet of graph paper.

# Step 2

Students continue with worksheet working through the ecological modelling component. Short video embedded in worksheet.

Teacher explanation:

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| Video on trapping small mammals [**https://youtu.be/unTuoBm7Tcs**](https://youtu.be/unTuoBm7Tcs)1. *Notomys alexis*, commonly known as the spinifex hopping mouse, is endemic to the arid zones of central and western Australia. Ecologist Dr Nicki Munro collected data on a whole range of small native mammals inside and outside the fenced reserve. Below are the data Nicki collected for the spinifex hopping mouse. Put this data into a graph.

*Students plot data on graph paper. These numbers refer to the mean number of animals caught for approx. 20 sites for a period 1 week at the same time each year.*1. Like all small native mammals, the spinifex hopping mouse does much better in the reserve where there are no foxes or cats. The fences at Arid Recovery have special one-way gates to allow small mammals to leave the reserve while not allowing rabbits or cats or foxes in. The hope is that the fenced reserve acts as a refuge for native mammals that then leave and breed outside the reserve. So far, however, all native animals that have left the reserve have died. Why is it that rabbit populations do well even in the presence of foxes, but native mammals do not?

*Rabbits and foxes have evolved together which means rabbits are adapted to an environment with foxes. They run fast and breed fast. Native mammals have not evolved adaptations to survive with foxes and are thus easy prey for foxes.*Chance environmental events are major disruptions that sometimes occur in an ecosystem. These are things like fire, floods or drought. It’s important that ecologists predict what might happen in these scenarios. Watch this video on ‘ecological modelling’. Video found at [**https://youtu.be/uwL81J0sdkc**](https://youtu.be/uwL81J0sdkc)1. What would happen to the spinifex hopping mouse if a drought hit? Let’s assume that the population stays the same as 2005. This is the baseline data. Work through the scenario, putting the population estimate in the boxes for both inside and outside the reserve.

**Inside****50****Baseline data** **Outside****3****Drought:** a severe drought has hit, causing the plants to reduce in number. With a reduction in food, small mammal numbers also drop to 10% of their baseline population.**Inside****5****Outside****0.3****Loss of shelter:** Rabbits eat low-lying bushes resulting in a loss of cover and shelter for small mammals, as shown in this picture of a bush from Arid Recovery. This means they are more exposed and easier for cats and foxes to catch. Numbers reduce to 10% of the population in areas where rabbits are present.**Outside****0.03****Inside****5**1. What has happened to the populations inside and outside the reserve?

*They have reduced in both, but they have reduced much more outside the reserve than inside.* The spinifex hopping mouse is just one of many native small mammals that are generally impacted in similar ways by rabbits, foxes and cats. Like these native mammals, rabbits are also consumers. So does it matter if native mammals are mostly replaced by rabbits? Let’s ask Dr Nicki Munro. Video at [**https://youtu.be/WhuidKNdv4w**](https://youtu.be/WhuidKNdv4w)1. Ecologists need to consider the **interactions of different factors** to understand ecosystem dynamics. If you were an ecologist, using this modelling data, what would you recommend in a plan to help the arid zone?

*There is no single answer but students should consider the following: populations need to be high enough to withstand chance environmental events. We could create more reserves that are fox free, but since so far this has only helped small mammals inside the reserve we should consider ways to control foxes across the arid zone. Because rabbits eat shelter used by small mammals which makes the impact of drought worse, we also need to control rabbit numbers.*  |