

# Reptile Movement Case Study: Teacher Guide

## **Lesson One:**

**Learning intention:** To understand the impact agricultural development has on animals ability to navigate their habitat

### **Success Criteria:**

- Identify issues associated with agricultural development
- Explain why there is an increased demand for food supplies.
- Understand how agricultural development affects reptile movement through the matrix

### **Lesson Sequence**

1. Introduction
2. Feeding the growing planet
3. Blind Navigation
4. Linking to the research
5. Reflection

### **Background Information:**

- Agricultural expansion means that natural habitats are becoming dispersed within a complex matrix of agricultural patches. Biodiversity is limited by a species ability to move through and around this matrix.
- Biodiversity conservation could be improved by understanding the fine scale mechanisms of species movement because then strategies can be put in place to facilitate this movement.
- This study focused on the movement of an arboreal (living in trees) gecko through fragmented landscapes with varied types of pastures.
- How does the type (improved pasture, native pasture or crop) and structure (pasture height) of different agricultural matrix environments influence the fine-scale habitat detection and movement of reptiles?
- How does crop sowing direction influence fine-scale movement of reptiles?

- Experiments were undertaken in south east Australia within fields made up of six different matrix environments: two cereal crops, short native pasture, short exotic pasture, long native pasture, and long exotic pastures. Native pastures are ground covers that have little or no fertilisation. Exotic pastures have a history of regular fertilisation. The experiment was repeated at two more spatially independent fields which means there were a total of 18 sites.
- 56 geckos were captured and released. 20 individuals were released to determine the perceptual range of the species (40-80m) - the range that geckos can recognise their habitat. The remaining 36 individuals were part of the main movement experiment. The mean distance the gecko's travelled was 32.7m.
- When geckos were oriented towards the target tree, it was found that pasture height was a more significant factor than the type of pasture for habitat detection.
- Effective movement of this arboreal gecko would be best facilitated by mature trees that are spaced evenly within 40-80m of each other. Large mature trees play a role in orienting the reptiles.
- Long pastures (exotic, native and crop) all posed a problem for gecko orientation and movement towards their target habitat.
- This study shows that low tree density and ongoing tree clearing is problematic in terms of biodiversity conservation. There is evidence to show that crop height and direction affect the movement of reptiles through the matrix and that crop management could be the solution to conservation of reptiles in agricultural areas.

### **Introduction (15 mins)**

Ask students to draw their home and school on a piece of A4 paper and their method of transport somewhere in the middle for 3-5 minutes.

Now ask them to draw 5 things that could get in the way of them getting school - you will get some very creative answers! Some examples could be...

- Rivers
- Landslide
- Fallen tree
- Bad weather
- Mountain
- Roads

Ask some students to share their ideas. Propose the idea of a wall or long grass getting in your way....

Introduce the concept of lizards in the agricultural matrix. If lizards go out of their habitat to get food or play, what might stop them from getting home? Allow 2 minutes discussion before sharing with the class. Some of the answers will be the same.

- What impacts might pastures have?
- Could roads and other landscape changes to agricultural areas be an issue?
- What if you were the size of the lizard? The risk of obstruction is much higher!

### **Feeding the growing planet (5 mins)**

Watch '*Challenges of feeding a growing planet*'

What does an increasing demand for food mean for agriculture?

How does this impact the landscape?

How does this impact the native species throughout the landscape?

### **Blind Navigation Game (25 minutes)**

*The instructions in full are attached to the right.*

Find an open location that has a landmark that can be considered the 'tree' or 'lizard habitat'. In groups of 5 or 6, students are to spin one group member around a few times to disorient them. The person is then asked to detect where the tree is. Repeat for each student.

Then ask students to blindfold the group members who is spun around. Pointing out the tree will now be more difficult because they are blindfolded. This is to mimic the impact long pastures can have on a lizard's ability to make its way back to its habitat.

Each group should consider the following discussion questions:

- Were players without blindfolds able to point in the direction of the assigned landmark?
- When blindfolds were introduced, did anyone point in the correct direction?

- What conclusions (if any) can you make about reptile movement through LONG and SHORT pastures? Explain.

Briefly discuss each groups results as a class.

### **Linking to the Research (10 mins):**

Show the *annotated diagram of reptile movement* on the board and discuss.

Are the reptile movement patterns similar to any of the class results from the *Blind Navigation* game?

The diagram is from the research paper ‘Pasture height and crop direction influence reptile movement in an agricultural matrix’. In the paper, it is labelled **Fig. 2**. See paper (linked at top of page) for further information.

### **Reflection (5 mins):**

Write 1-2 sentences to answer the following: Which type of development has greater detrimental effects of on the environment - agricultural or urban? Why/Why not?

## **Lesson Two:**

**Learning intention:** To identify ways agricultural development can be altered to reduce impact on native species in the matrix.

### **Success Criteria:**

- Identify ways agricultural development can be altered to assist reptile movement through the matrix.
- Construct a written piece detailing issues and solutions for agricultural development

### **Lesson Sequence**

1. Conservation Implications - Reptiles
2. Understanding Figures worksheet
3. Write a Letter
4. Reflection

### **Background Information:**

- Please refer to background information above as this lesson still concerns reptile movement in varying crops.
- Management of pasture height can influence species movements but is rarely considered when in management plans concerned with connecting fragmented landscapes. They often opt for tall pastures as it benefits poor-dispersing fauna at risk of agricultural fragmentation, reduces predation and prevents loss of ecosystem function.
- Enhancing movement across matrixes can be achieved by maintaining narrow strips of low vegetation among taller pastures to facilitate directional movement but also minimize predation and increase perceptual range. Strip grazing or mowing pastures directionally between habitat fragments needs to be investigated
- Targeted management of cropping could enhance connectivity for some reptiles in fragmented landscapes. Such as directional sowing between habitats represents an important opportunity to link isolated habitat remnants to facilitate greater directional movements for species who otherwise remain exposed to negative effects of the matrix.
- Corridors of native vegetation can reduce impacts of land clearing by reducing isolation of remnant vegetation. This is however dependent on remnant size and condition.

- In human fragmented landscapes, population extinctions usually exceed colonisation resulting in gradual decline. The solution to this is often corridors, which are known to have positive conservation outcomes. However predicting efficacy of a corridor is difficult due to varying landscape elements.
- Reptile abundance declines in farming landscapes The condition of remnant vegetation may have a greater impact on reptile abundance, especially loss of shrub diversity as a result of livestock grazing.
- Fragmentation and isolation of populations results in reduced population size, decreasing genetic variation and divergence among populations. Under these circumstances, fragmented populations may face an increased risk of extinction due to inbreeding depression, disease or the accumulation of deleterious mutations
- Although some reptile species appear to be more successful in the agricultural landscape than they might have been prior to clearing, their localized success should be viewed in the broader landscape context. All but one species have declined from up to 90% of their former range due to land clearing. Furthermore, linear strips, even those in good condition, do not provide connectivity for many reptile species, either because they are too narrow (all < 100 m), or because the habitat within them is altered, for example, by grazing
- Populations that are small and isolated face a very high risk of extinction and no chance of replacement

### **Conservation Implications - Reptiles (10 mins)**

Split students up into four groups to discuss one of four topics for 5 minutes...

They are to write notes on key ideas. Students must come come up with an explanation *WHY* the statement is true and consider *WHAT* the implications are for reptile conservation.

1. Reptile populations that are small and isolated face a high risk of extinction and no chance of replacement
2. Corridors or strips of native vegetation between tall pastures can reduce impacts of land clearing
3. Most reptile species are found in remnant vegetation as opposed to in the agricultural matrix
4. The habitat within narrow patches of native vegetation is often altered by livestock grazing along the edges.

Now the class must form new groups of four so that one person from each thinking group can share what was discussed for 1 minute.

### **Understanding Figures (15 mins):**

Distribute *Worksheet 3: Understanding Figures* worksheet to all students. They may wish to work in pairs to help them interpret the diagrams.

Read through the first page as a class to ensure students understand the diagrams then get students to complete the questions.

You may wish to collect this as an assessment of learning.

### **Write A Letter (30 mins):**

You have noticed that the wheat farm in town has gone up for sale. New owners have taken interest and at the last council meeting they expressed that they hope to double their production by clearing more land and sowing more wheat. This is because the town has increased in size and requires more supply to meet demand.

**Part A (5 mins):** Talk about the scenario as a class. Project an image of the current landscape which is home to the arboreal gecko, *Christinus marmoratus*.

**Part B (15 mins):** Ask each student to write a letter (half - one whole page) to the farmer who intends to buy the land. Students must consider the following points:

- A brief introduction: who you are, where you're from, what you're writing about.
- Why this is important to you
- What implications the clearing of land may have on native species
- What implications the sowing of more wheat may have on native species
- Why it is important to conserve species such as geckos.
- Any changes they could make to their plans to reduce the impact on native species and reptile populations on their land (think about the direction of crops and or their height).

**Part C (10 mins):** Students pair up and read their letters to each other. The pairs should give feedback and constructive criticism on the composure of the letters.

*IF you were the farmer, would this letter provide you with enough information to help you consider biodiversity conservation in your agricultural practice?*

**Reflection (5 mins):** How has this learning sequence changed your view on human impact on native species? Are there any changes you can make in the future to reduce impact?