



Squirrel Wood Survey



Mark and Simon want to find out how many squirrels there are in Squirrel Wood. They know it is hard to actually see squirrels in a wood, especially in conifer woods. However, there is a path through the wood and you can sometimes see squirrels along this path.



Norway Spruce Cone

Mark and Simon also know that cones that look like the one to the right have been eaten by squirrels.

If they count up the number of eaten cones and uneaten cones, they can make an estimate of how many squirrels there are in the wood.

However, it would be impossible to try and count all of the cones in the wood so they decide to do a sample.



Norway spruce
eaten by a squirrel

Important Information

- Squirrel Wood is a 850 hectare (ha) conifer woodland. The trees here are all Norway Spruce.
- Norway Spruce has very small seeds, but provides enough food for red squirrels
- The average amount of energy for one Norway Spruce cone is 17.69Kilo Joules (Kj)
- Adult red squirrels need to eat about 150,000 KJ per year to live

Squirrel Surveys

Mark and Simon did two types of survey in Squirrel Wood.

1. Visual Transect

Mark and Simon walked along the 600m-long footpath (A-B on the map) looking for squirrels and signs of squirrels. They walked very slowly and every 100m they stopped for 5 minutes to see if they could spot any squirrels within 10 m either side of the path (the transect width is 20m).

These points are marked on the map as **a1** to **a5**. They recorded their data in Table 1. They also noted any other signs of squirrels - dreys and eaten cones - at these points and put this information in Table 1. They removed all eaten and uneaten cones from the stop points **a1** to **a5**.

Mark and Simon repeated this walk on three different days (T1 to T3 in Table 1).



2. Cone Quadrats

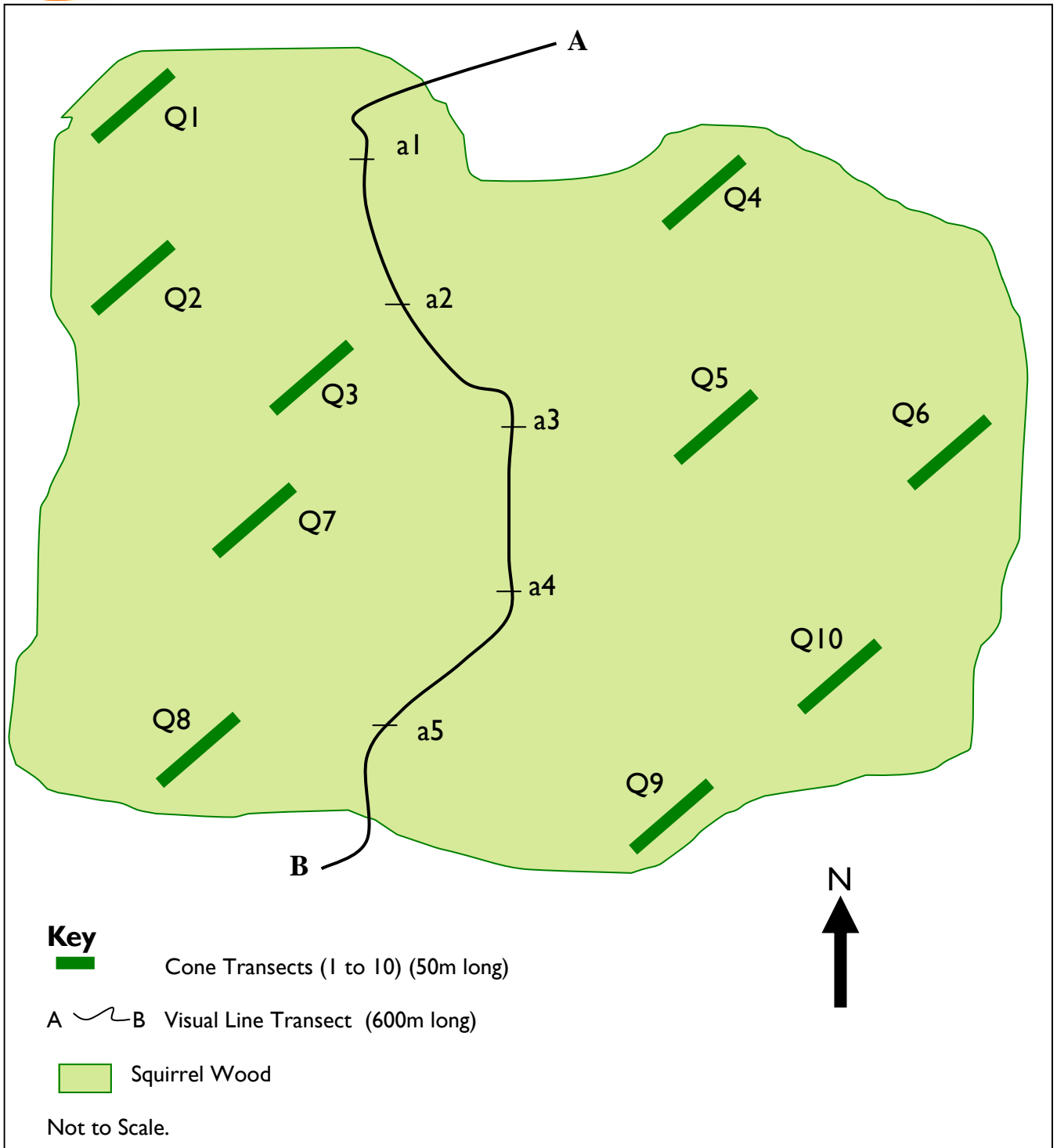
Mark and Simon made 10 Cone Quadrats, Q1 to Q10.

Each Quadrat is 50m long and 1 m wide and has an area of 50m².

They counted all the eaten and uneaten cones in each of the quadrats and put the data in Table 2.



A Sketch Map of Squirrel Wood Showing Transect Lines





Results



Mark and Simon recorded all their results in Tables 1 and 2.

Table 1. To Show Evidence of Squirrels Along the Visual Transect A to B

Stop Number	Red Squirrels			Dreys			Eaten Cones		
	T1	T2	T3	T1	T2	T3	T1	T2	T3
a1	0	1	0	2	2	2	12	2	1
a2	1	0	0	0	0	1	20	3	0
a3	0	0	2	3	3	2	0	3	2
a4	1	0	0	0	0	0	27	0	1
a5	0	0	0	0	0	0	14	5	7

Information Needed to Calculate the Density of Red Squirrels in Squirrel Wood from Visual Transects.

1. Work out the total number of squirrels seen during the Transects = _____ squirrels
2. Work out the total distance walked (clue - they walked 600m three times) = _____m
3. What was the total width of the transect = _____m
4. Density of squirrels per m² = $\frac{\text{total Number of Squirrels}}{\text{Transect Width} \times \text{Total transect distance}}$ = _____ squirrels/m²
6. Density of squirrels per hectare = squirrels/m² × 10,000 = _____ squirrels/ha



Table 2. Results of Cone Quadrats

Quadrat Number	Whole Cones	Eaten Cones
1	10	5
2	45	3
3	68	25
4	12	0
5	9	0
6	32	12
7	46	32
8	26	6
9	44	26
10	30	1

Information Needed to Calculate Number of Squirrels/ha of Woodland from Cone Quadrats:

1. Find out the total number of squirreled cones = _____
2. Divide this by the total area surveyed (remember 1 quadrat is 50m²) = _____ cones/m²
3. Multiply this answer by the energy value of a Norway Spruce cone = _____ Kj/m²
4. Multiply this answer by 10,000 to convert m² into hectares = _____ Kj/ha
5. Multiply this answer by the total area of the woodland to give you the estimated total amount of food energy used by squirrels in the woodland = _____ Kj
6. Then divide this answer by the amount of energy squirrels need per year to survive = _____ red squirrels in the woodland.
7. Finally divide the estimated number of red squirrels in the woodland by the area of the woodland = _____ red squirrels/ha. This is the density of red squirrels in this wood.



What Did Mark and Simon Find Out?



- A.** Draw graphs to show Mark and Simon's data.
- B.** Use the information in the Tables, the Map and the Calculation Tip to help you answer the following questions....
1. What is the density of red squirrels in Squirrel Wood from the Visual Transects?
 2. What is the density of red squirrels in Squirrel Wood from the Cone Quadrats?
 3. Which method do you think is more accurate? Why?
 4. Why do you think it is hard to see red squirrels?
 5. How does the number of cones seen in the Visual Transect Surveys change from Time 1 (T1) to Time 3 (T3)? What might be happening here?
 6. How does the number of dreys seen at change between T2 and T3 at
 - i) **a2** and
 - ii) **a3** ?

What might have happened in each case?

7. Why might the number of cones vary in different parts of the wood?
8. Why might the number of squirreled cones vary in different parts of the wood?
9. If there were grey squirrels in or near Squirrel Wood, which survey method (Visual Transect or Cone Quadrat) would be better? Explain your answer.
10. Finally - do you think this is a good woodland for red squirrels? Will they be able to survive here in the long term? Explain your answer.

You can do some research on these websites to help you with this question:-

- www.saveoursquirrels.org.uk
- www.forestry.gov.uk/forestry/Redsquirrel
- www.red-squirrels.org.uk
- www.redsquirrels.info