



# An Ecological Sound Education

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Listening for biodiversity

# Nature deficit disorder

- Richard Louv coined the term 'Nature deficit disorder' in 2005 stating that children nowadays spend significantly less time in nature and that this change results in numerous behavioural and mental health issues. In addition to this, he argues that our fixation with technology, and the disconnection from the natural world that this has caused, has led to a diminished use of the senses and a rise in attention difficulties (Louv, 2005).
- Michael Bull further develops this idea, arguing that whilst people are still engaging with nature, they often do this whilst listening to music through their headphones and this creates a barrier between them and the world around them (Thompson, 2012). This suggests that we perhaps need to change the way in which we interact with nature in order to fully appreciate and understand the natural world as well as feel the benefits to wellbeing that have been widely acknowledged.

# Active listening

- Sound is often an overlooked way of engaging with biodiversity, with many prioritising sight over sound when monitoring areas. However, active listening is gaining more attention as a field of research across many disciplines. Listening is often quite a passive act whereas active listening is a skill that involves the individual focusing in on different sounds in order to process them and try to understand what they hear. Essentially active listening means that listening is your main objective, in contrast to passive listening where your senses pick up sounds whilst you focus on something else.
- The exercises in this pack aim to prime your ears to become a more active listener and demonstrate how this may be useful in terms of monitoring biodiversity.

# Choosing a site

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- The following exercises were created using Morton Lochs, Tentsmuir, as a test site. However, every environment has its own soundscape and as such, the following exercises are not limited to Tentsmuir.
- Ideally, the place that you choose would have a structure similar to the bird hides at Morton Lochs, where you can have a window between you and the sounds around you. This, however, is not crucial to the listening tasks but could be something as simple as staying inside your accommodation and opening your bedroom window.





# General Listening Exercises



# 1. Before the field

- What sounds would you expect to hear at the site?
  - Being as specific as possible, make a list of all of the sounds you might expect to hear at Morton Lochs NNR or your chosen location.

## 2a. In the field



You will be given 3 minutes to write down ALL of the sounds you hear.



After this time, share what you heard within small groups.



It is important to note both similarities and differences recorded by everyone – write a list of the sounds that everyone noted down and a separate list for sounds heard by just one person.

## 2b. Comparing expectation to reality

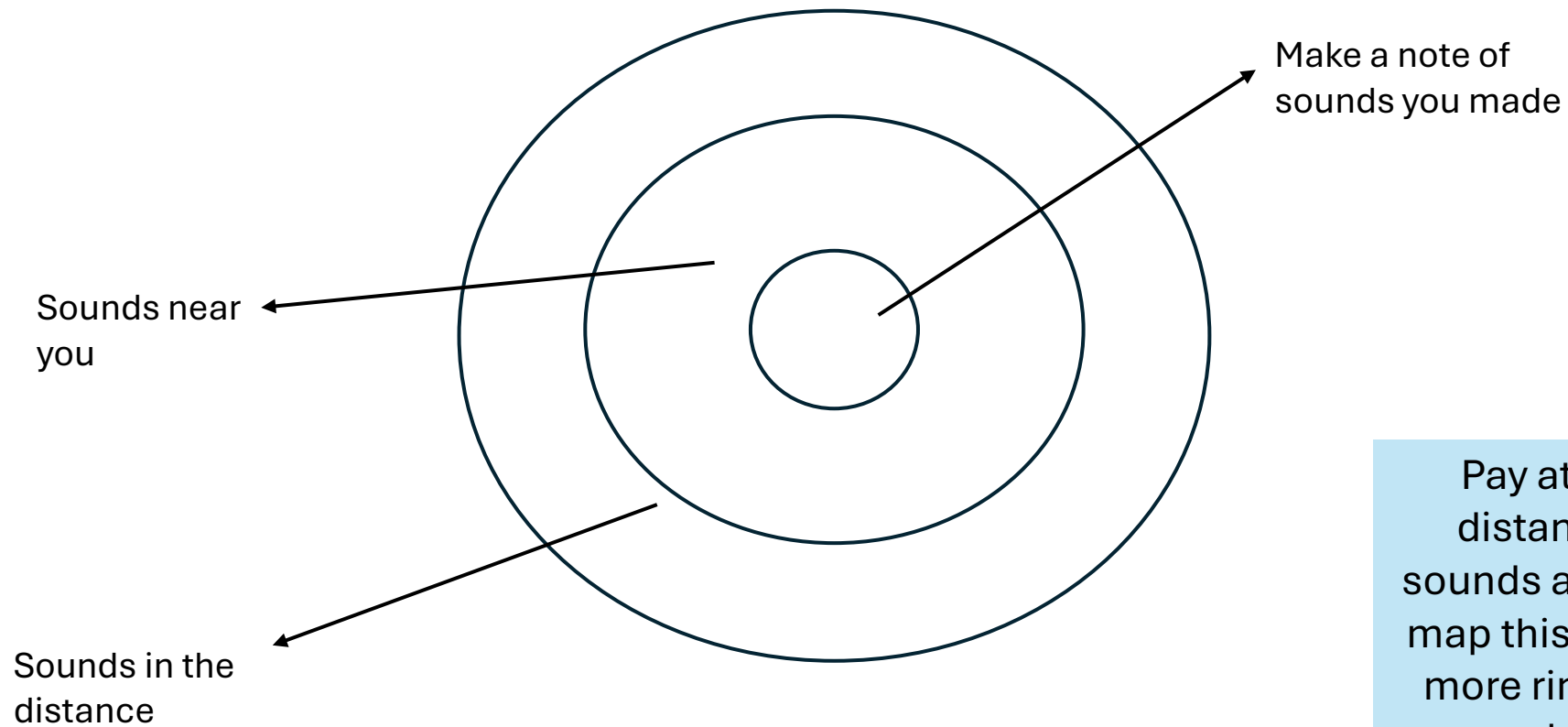


Do your lists from tasks 1 and 2a differ? If so, highlight sounds that you didn't expect to hear but did, as well as sounds you are surprised that you did not hear.



Discuss in small groups what sounds were familiar and unfamiliar to you. Why do you think this is?

### 3. Sound surrounds you



Pay attention to both the distance and direction of sounds and use the diagram to map this. You may wish to add more rings to provide a more detailed diagram

## 4. Spatiality

- This exercise asks you to think about your environment and what you can tell about it through listening
- Steven Feld (2015) introduced the concept of **acoustemology** by combining 'acoustic' and 'epistemology' in a social study of sound as a way of knowing and understanding the world around you through sound. This exercise asks you to focus on how structures surrounding you impact the soundscape.
- The bird hides at Morton Loch provide an interesting listening point as the sound around you is muffled, focusing your attention on the sound through the open window.
- Before you start this exercise, find a space similar to a bird hide where you can focus the sound from one direction (this could even be a bedroom with an open window) or a safe space outside where you can sit and close your eyes to focus on sound.

## 4. Spatiality

- Do the sounds around you make the space feel open or closed?
- Are there barriers impacting/shaping the sounds you hear? E.g. tall buildings, trees
- How did your space facilitate or limit your listening?
- Think about whether some sounds are muffled intentionally and what sounds want to be heard. This could be discussed in groups about sound in nature more generally.



# 5. Listening Walk

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- Take a walk through the nature reserve, or your chosen location. In order to have the best experience, students should do this either at different times or walk in single file and far enough apart that they cannot hear the next person's footsteps. When what you hear seems to change, stop, take a brief note of your surroundings and answer the following questions and prompts:
- A) What is the loudest sound?
- B) The softest sound?
- C) Note two sounds that moved past you.
- D) Note one sound made in response to another.
- E) Note any sounds with a distinctive rhythm.
- F) Were there any unexpected sounds?
- G) Is there something in the shape of your environment changing the sound acoustemology?

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# Listening Walk Overview

- Did you have the same answers at numerous checkpoints for any of the questions? If so, make a list of all the sounds that were persistent throughout the walk.
- What was the most memorable sound from the walk? Why?



# Analysing Sound



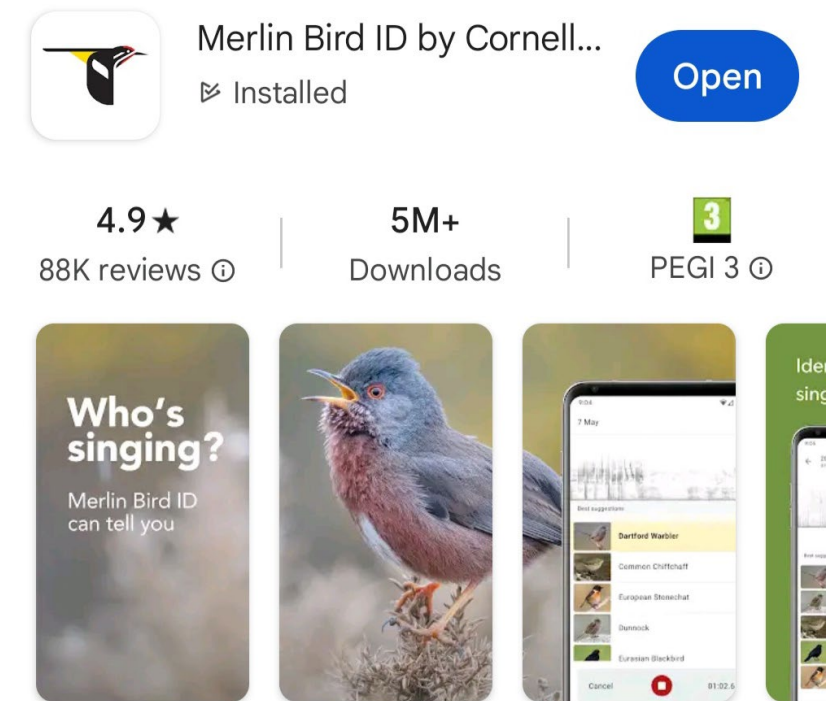
The following exercises involve a more detailed approach to listening

## 6. Coding Sound

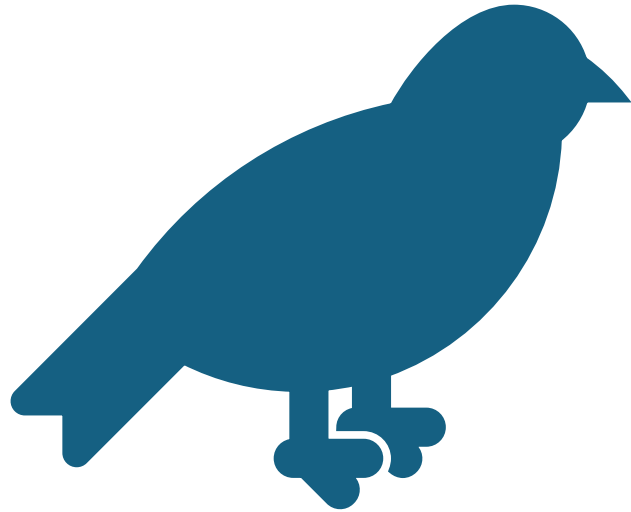
- Using your lists from exercises 2a and also from the listening walk, you are now going to 'code' sounds. Coding is a way of systematically assessing information. Coding helps us think more about relationships between organisms or elemental phenomenon (e.g. variety of species, or species within wind or water) using sonic markers (e.g. are sounds continual, repetitive, etc.); coding applied by humans to the more-than-human world also invites us to think reflectively about our human response to sound and space (proximity, volume, etc.)
- We will assign a letter designating whether the sound is natural (N) or human made (H) to provide a basic code. You may wish to add subcategories to these codes such as elemental (E) and technological (T). Which category predominates?
- Sound is not static – some sounds may have continued unceasingly throughout your listening time, others may have been repetitive or only heard once. Further code the sounds by continuous (C), repetitive (R), and once (O).

# Merlin ID app

- Created by the Cornell Lab of Ornithology, Merlin is a free app that allows you to identify birds through bird song and calls, photos or answering a series of questions.
- The app is based on sound ID but does not require the user to have any prior knowledge of birds.
- Not only does Merlin identify what birds are present through their song, highlighting what birds are present in live time (which allows users to become more familiar with birdsong), but it also stores these recordings on the app along with time of recording, location and a spectrogram (a visual graph of the sound that shows e.g. duration, rhythm pattern and pitch contour).

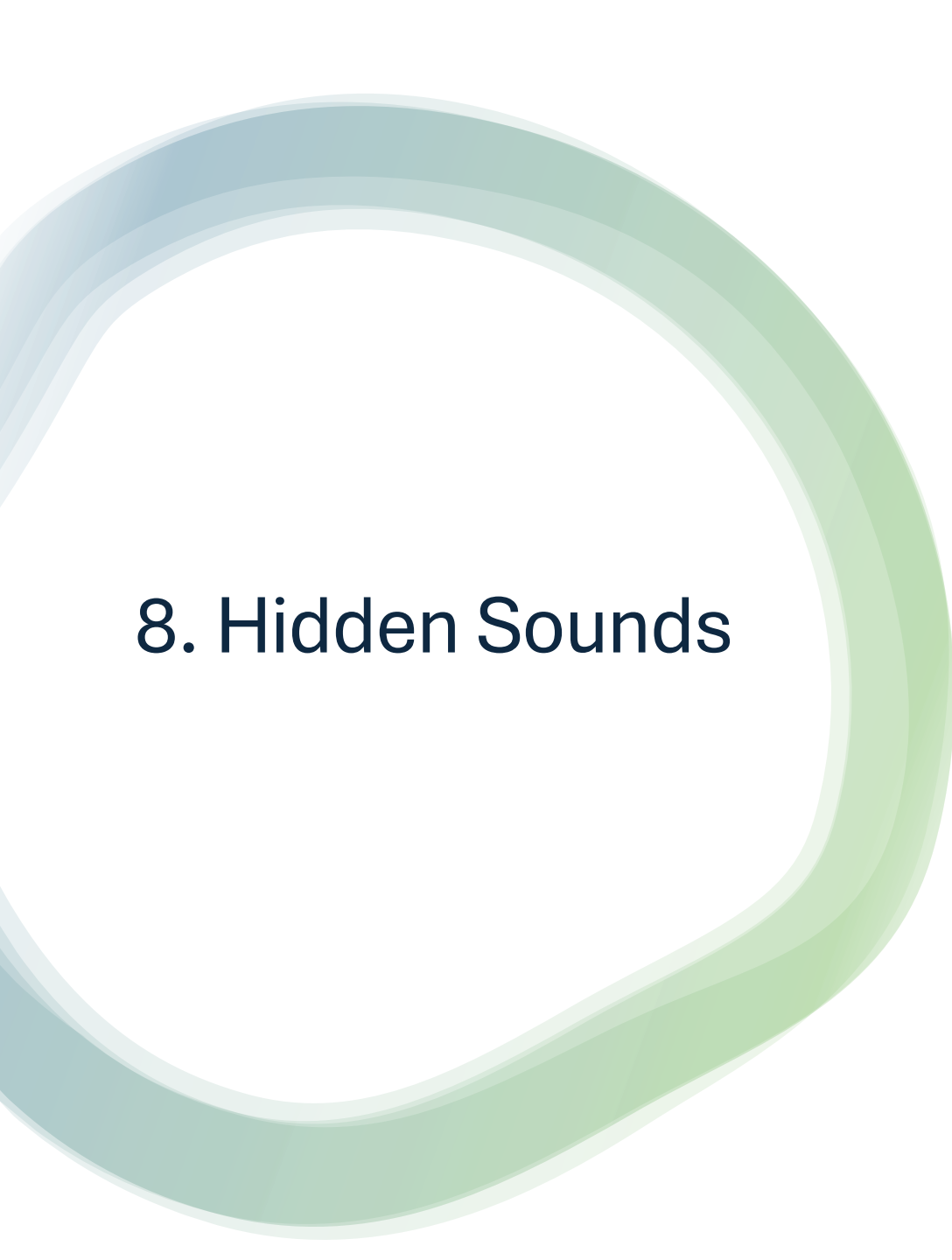


What's that bird? Answer 5 questions or upload a photo to get an answer.



## 7. Monitoring species

- Spend 3 minutes listening specifically to bird calls. Have the Merlin app open and recording whilst you do this.
- How many different birds did you hear during this time? You do not need to have perfect birdsong knowledge; you can simply note the number of different calls you hear.
- How many different birds did Merlin identify?
- Did you hear anything Merlin did not pick up?
- Discuss in small groups the benefits and limitations of Merlin and your own listening skills as tools to measure biodiversity.



## 8. Hidden Sounds

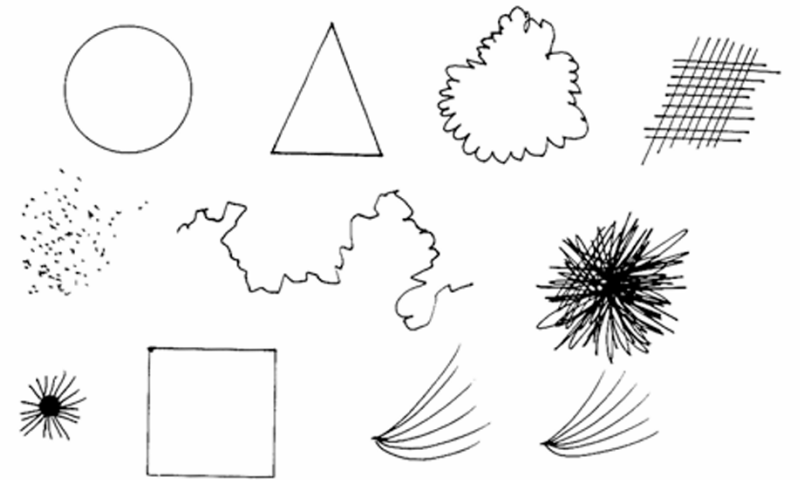
- **Separate sight from sound. Many people do not trust their hearing as much as their sight, however, ‘people predominantly hear, rather than see, birds’ (Morrison et al., 2021, p.2). Make a list of sounds you can hear but cannot see. You may also wish to consider sounds you sense through your body e.g. vibration**
- Here are some of my examples from Tentsmuir:
  - Wind
  - Grasshopper
  - Northern lapwing call
  - Western House-Martin call
  - My breathing
- You may wish to utilise the Merlin ID bird app to help you identify birdsong.



Drawing Sound

## 9. Matching sounds with images

- Sounds cannot be seen but this does not mean that they do not prompt images in your mind.
- Try and match each shape on this page with a sound you can hear. Discuss in your small groups to see if anyone shared the same idea.





# 10. Drawing your own sounds

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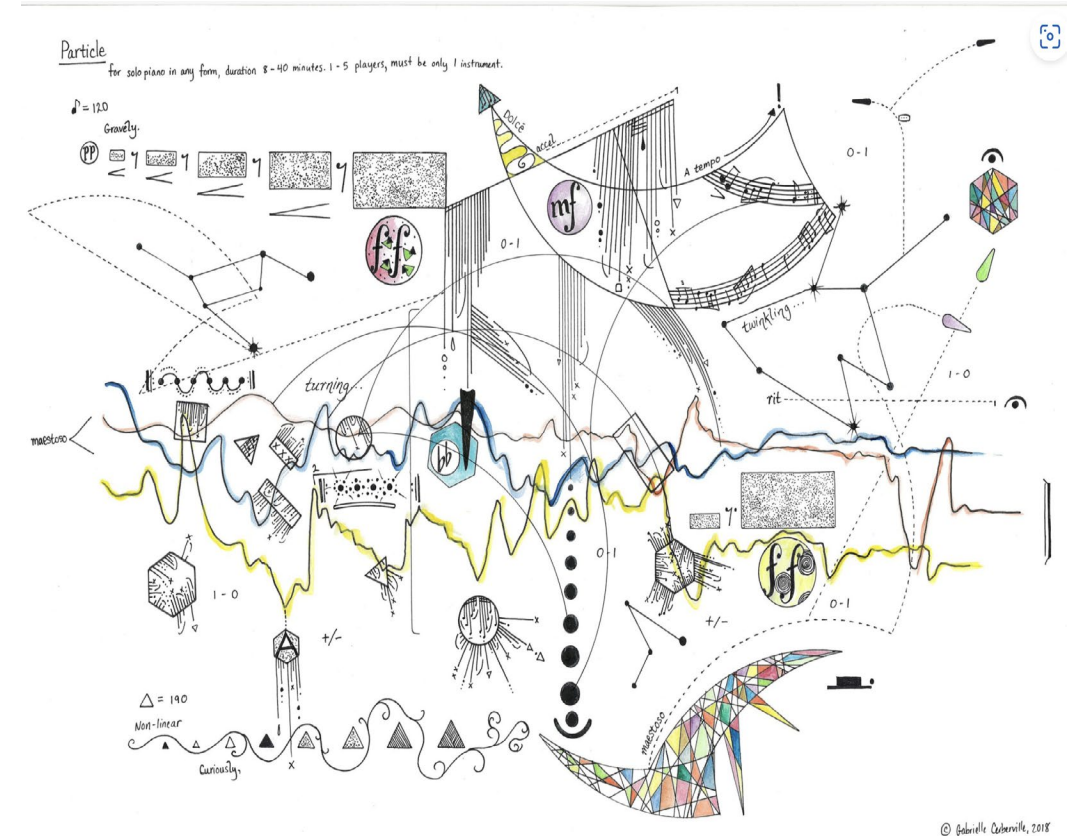
- This exercise is very similar to the last exercise, however instead of matching sounds to a shape you were given, you should draw your own shapes for sounds.
- You should aim to draw between five and ten different sounds. There is no correct answer, this task simply encourages a more creative approach to listening.

# 11. Drawing a soundscape

- Take 5-10 minutes and on an A5 or A4 size piece of paper, draw the environment around you through sound.
- Think about what sounds you want to highlight.
- You may wish to use different colours to draw attention to different sounds.
- How can you represent proximity, volume, duration of a sound, rhythm, pitch, and location (either relative to you or to other sounds in the space)?

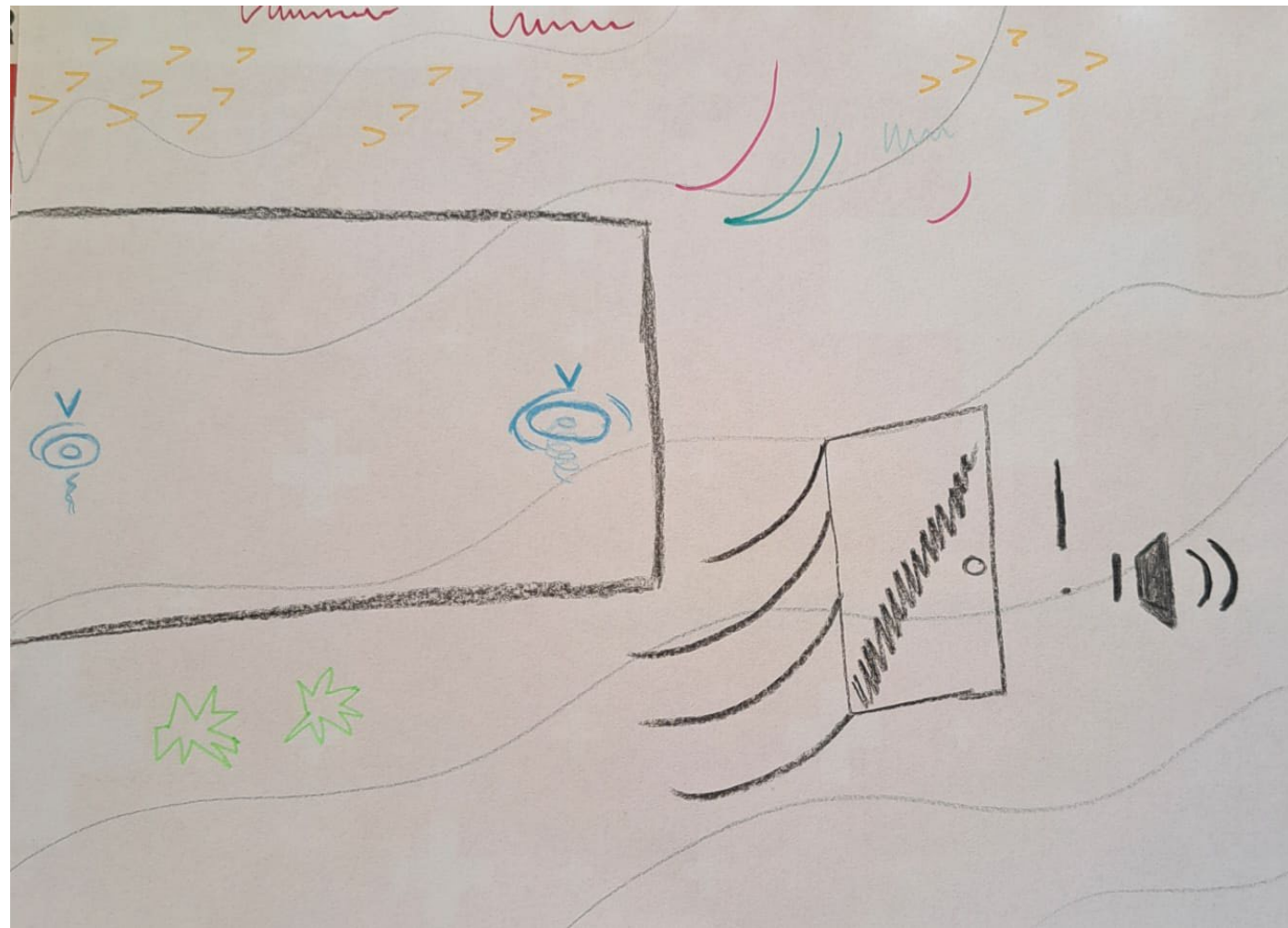
# Graphic Score

- You have just created a basic graphic score. A graphic score uses images, shapes and pictures instead of conventional music “notes”. Some modern composers use graphic scores instead of traditional music notation to describe and record their musical ideas, particularly where they want to express musical ideas that could not be described by traditional notation. Many of them are very beautiful. Some graphic scores come with very detailed instructions on how to decode the images, whereas others are deliberately imprecise, to allow interpretation in performance.
- So: think about what you want to communicate unambiguously, and what you want to highlight as needing more exploration; use this as a tool highlight the big ideas that you took away from the field experience.



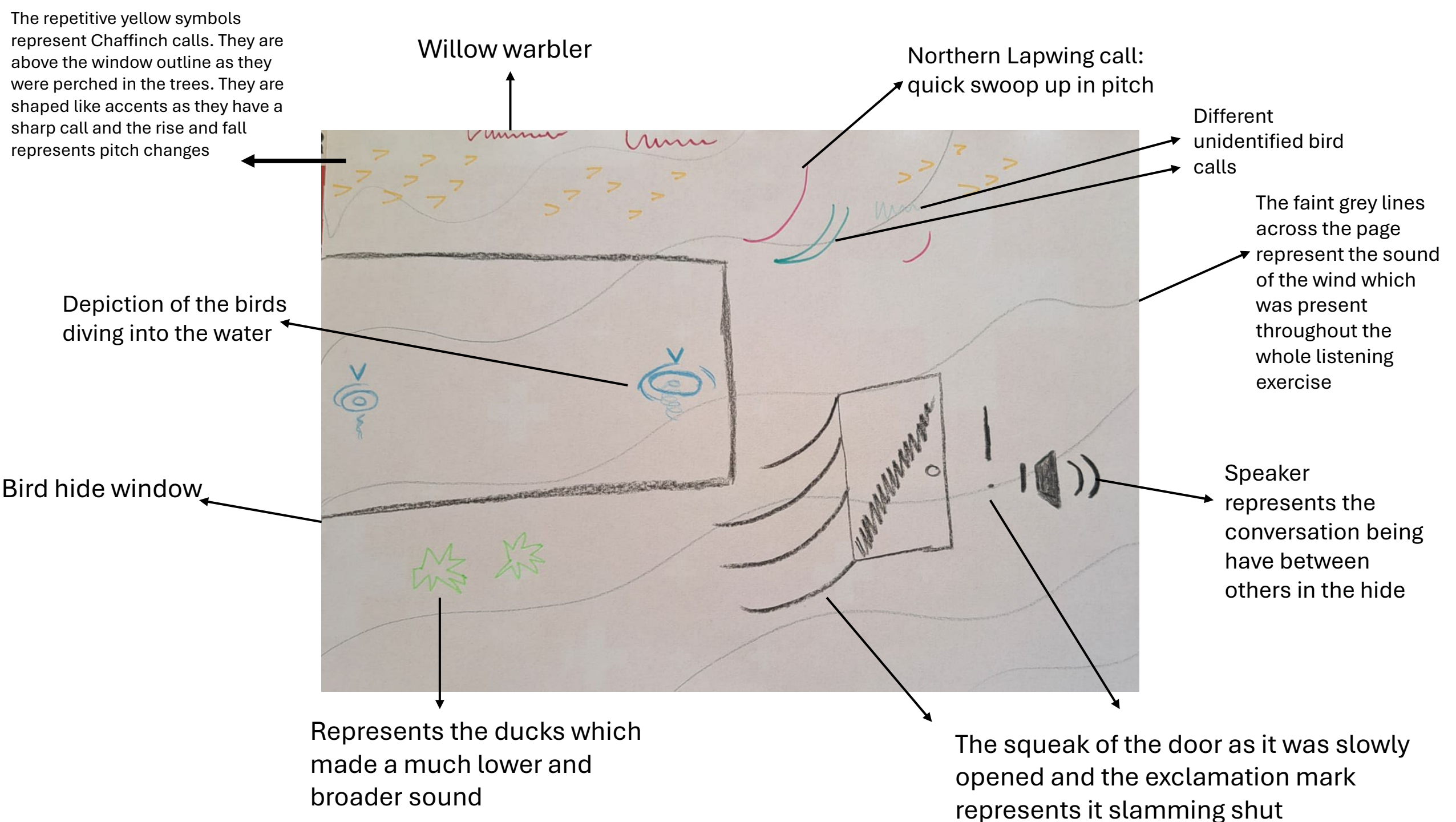
# Example Graphic Score

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# Explanation

- Graphic scores are a very personal depiction. As such, they need description so that someone else can understand what your symbols mean, and any parameters that brought a particular focus to your observations.
- In my graphic score, I chose to focus mainly on birdsong. In order to highlight the bird song, I drew each of the different calls in pen. Each species of bird is drawn in a different colour and shape, representing the different species present during the exercise. I also wanted to represent place and human influence which is why there is an outline of the window of the bird hide, helping to demonstrate proximity of different sounds, and a representation of the door opening before people came in and started speaking.



# Sound Lexicon

- Consider whether the graphic score is a physically **BOUNDED** representation on e.g. a single sheet of A4 paper, with sounds distributed relative to the listener in the centre of the diagram, or a **CONTINUOUS** scroll aligning to a timeline, assuming the listener experience is moving parallel to the timeline.
- Are some categories of sound better drawn one way or another, or equally amenable to both?
- These terms may be helpful when writing the explanation for a graphic score

| A Lexical Primer for Graphic Scores of Environmental Sound |                                                                                  |                                                                             |                                                                                                                                                                                                                                                                                                                                            |                       |
|------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Category                                                   | Absolute                                                                         | Dynamic (changing)                                                          | What is communicated?                                                                                                                                                                                                                                                                                                                      | Score Characteristics |
| Proximity                                                  | Near, far<br><br><i>(*may map to loud / soft volume of sound)</i>                | Coming towards (up/down/left/right)<br><br>Moving away (up/down/left right) | <i>Indexes</i> the space between source of sound and listener – may index areas of the habitat that are more or less important to particular sonic phenomenon                                                                                                                                                                              | BOUNDED               |
| Volume                                                     | Loud, soft<br><i>(*may map to proximity)</i>                                     | Growing<br>Dying away                                                       | <i>Indexes</i> proximity between source and listener; in birdsong, may be part of the iconic structures of a particular bird call                                                                                                                                                                                                          | CONTINUOUS            |
| Articulation                                               | Sudden                                                                           | Feathered, or<br>fade-in / fade out                                         | Sonically this overlaps somewhat with volume – but careful listening reveals that it <i>indexes</i> the physical process of making the sound, with a sudden accented sound requiring more energy to make than a more gradually sound.<br><br>May also <i>symbolise</i> the presence of a threat – consider, why, from whose point of view. | CONTINUOUS            |
| Duration                                                   | Long / short                                                                     |                                                                             | Iconic of sound source; may be precisely timed.                                                                                                                                                                                                                                                                                            | BOTH                  |
| Rhythmic                                                   | Yes/no – i.e. rhythm is understood where > 2 sounds occur in temporal succession | Constant / Intermittent<br><br>Pulsed / Irregular<br><br>Patterned / Random | Iconic of particular sounds sources (e.g. birds)<br><br>Parallel to pitch contour – think about whether morse-code-like units of short/long e.g. [ _ .. ] can describe the relationship of long/short sounds, if a recurring pattern is present                                                                                            | CONTINUOUS            |

|                |                                                            |                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                     |            |
|----------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Texture</b> | Complex / Simple                                           | Uniform (one single sounding source)<br>Polyphonic (multiple overlapping sounding sources)                  | <p><i>Indexes</i> the presence or absence of different sounding entities – potentially, abundance of many individuals or different types of sounding sources</p> <p><i>Symbolically</i>, simultaneously interacting sounds may also produce an overall soundscape timbre that feels (from the point of view of the listener) either pleasant / harmonious or rough / discordant</p> | BOTH       |
| <b>Timbre</b>  | Pure, Rough, Thick, Thin<br>Liquid, Pleasant, Harsh<br>etc |                                                                                                             | <p><i>Iconic</i> of the sound source (e.g. crows sound uniquely different from robins)</p> <p>The range of words used may also shade into <i>symbolic</i> aesthetic values associated with particular different kinds of timbre.</p>                                                                                                                                                | BOTH       |
| <b>Pitch</b>   | High, Low                                                  | <p>Conjunct – moving from point to point smoothly</p> <p>Disjunct – moving from point to point in leaps</p> | <p><i>Iconic</i> of particular sound sources (e.g. birds)</p> <p>*think about ‘drawing’ a moving pitch contour as if it were a flying line</p>                                                                                                                                                                                                                                      | CONTINUOUS |

# 12. Sound loss



Research has shown that natural soundscapes are being eroded and silenced due to climate change and anthropogenic noise pollution.



Make a list of what sounds might be lost over time. Why?

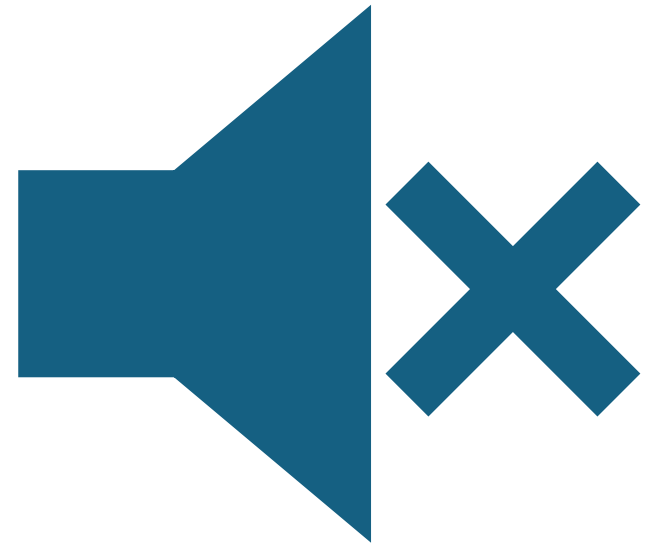


Might comparing sound recordings year by year give an accurate indication of biodiversity change? What are the limitations?

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# 12. Sound Loss

- [BBC Radio 4 - Illuminated, Shifting Soundscapes](#)
- The link above is for an interesting Radio 4 programme on listening to a place with a 50-year gap between recordings. The loss of sound density was substantial over the period and demonstrates clearly how sound can be an important tool for measuring biodiversity.



# 13. Preserving Sound

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- After having completed some of these exercises, discuss in small groups what are the best ways to preserve sound, simple recordings aside.
- Thinking about the different ways that you have now recorded sound (written description, drawing specific sounds, coding lists, graphic scores) consider which methods you think are most helpful in preserving sound. Make a list of the pros and cons of each method.
- Consider whether sounds need to be contextualised in order to be understood at a later date.

# Reflection

- Hopefully these exercises have not only demonstrated the potential usefulness of active listening for understanding biodiversity but have also proven to be beneficial on a more personal level.
- Studies have shown that spending time outside and truly engaging with nature is an excellent mindfulness tool which can significantly promote overall wellbeing.
- If you would like to further develop your listening skills or would like to continue using listening to nature as a wellbeing tool, a listening diary is a great way to do this. Merlin is a fantastic resource as it stores all your recordings in the app creating a basic sound diary. Alternatively, you could choose some exercises from this booklet to carry out and keep a note of them yourself.

# References

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