TURTLES IN SCHOOLS

TERM 3 WORKBOOK

Photo credit: Bellingen Riverwatch

1 Million Turtles

COMMUNITY CONSERVATION PROGRAM

Photo credit: Dr James Van Dyke

TURTLES IN SCHOOLS

Produced by the
1 Million Turtles Community
Conservation Program
and funded by
The Foundation for National
Parks and Wildlife.

In the pages that follow, you will find a comprehensive set of lesson plans. Our initiative is not just about imparting knowledge but fostering a deep connection between students and their natural environment and instilling a sense of responsibility and awareness of freshwater turtles and their conservation.

As we embark on this educational venture, we extend our gratitude to educators, students, and all those who champion the cause of conservation. The Turtles in Schools Program is not just a curriculum; it is a movement to inspire the next generation of environmental custodians.

Thank you,

1 Million Turtles Community Conservation Program

LESSON

TERM THREE

WATER QUALITY TESTING

- Learning Intentions
- Background
- Activities
- Curriculum Mapping

Photo credit: Dr Donald McKnight

Learning Intentions

(1) Conduct water quality testing.

(2) Collect water samples for eDNA analysis.

Background Information

eDNA Testing

Environmental DNA (eDNA) refers to genetic material (DNA) shed by organisms into their environment.

eDNA allows us to monitor native and invasive species and conduct broad-scale biodiversity monitoring.

Benefits of eDNA sampling:

- Eliminates the need to directly observe or capture organisms.
- Less invasive and cheaper than traditional sampling methods as no special sampling permits or specialised personnel are required.
- Can detect species earlier, allowing for effective management outcomes.
- Can detect species that are low in abundance or cryptic.
- Can be used to detect species in areas that are difficult to access with traditional sampling methods, such as trapping.
- Scientists can study many areas quickly and easily.
- Sampling can be conducted in any weather.
- Fosters community engagement as it is a citizen science friendly method.

Background Information

eDNA Testing

How do we target what is in the water?
DNA barcodes - a specific gene region (DNA segment) is targeted for the organisms that we are interested in detecting. This is referred to as a DNA barcode.

A common “universal” region or barcode can be targeted across multiple species, but it needs to be specific enough to exclude animals that we don’t want to detect.

The DNA segment can have small variation among individuals of the same species, but greater variation for different species.

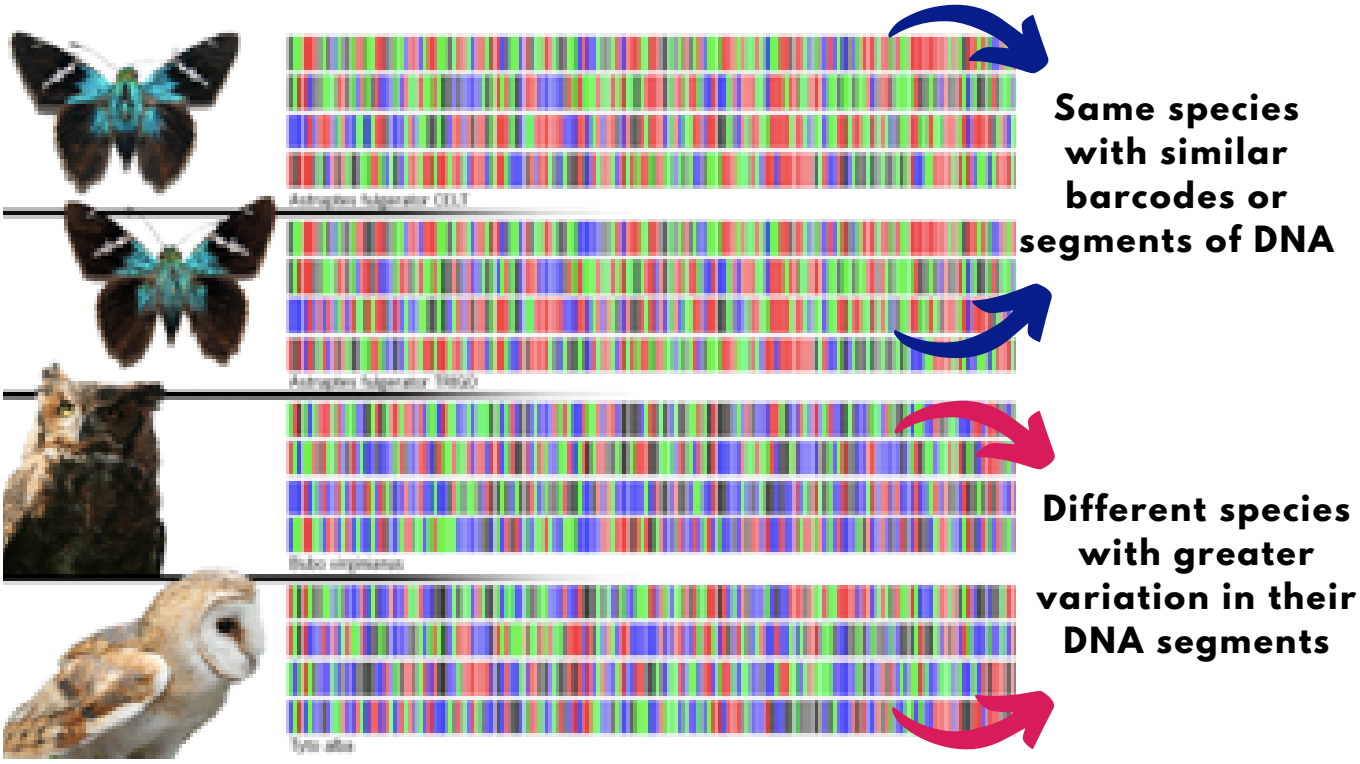


Image credit: Suz Bateson, University of Guelph

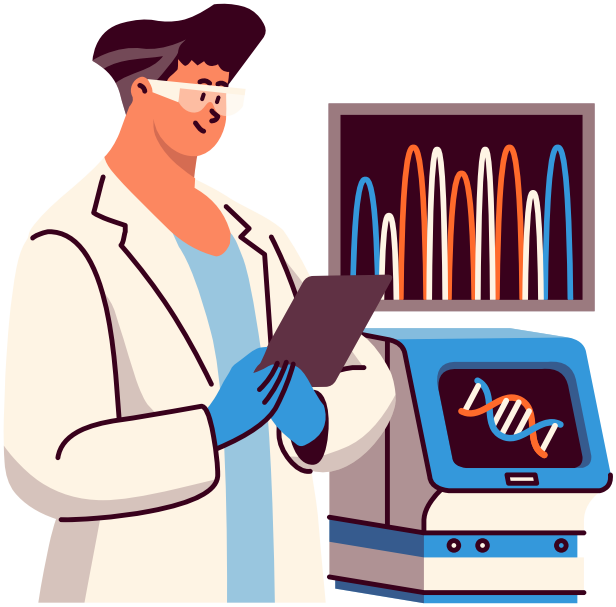
Background Information

eDNA Testing

How do we find out who is in the water?

In the laboratory:

1. DNA fragments in the water samples are amplified using PCR (Polymerase Chain Reaction). This process is used to make many copies of the specific DNA region.
2. Scientists then read the DNA sequences.
3. Species are then identified by comparing the DNA fragments to a database with reference sequences to determine which animals DNA are present in the sample and the sampling site.



Background Information

eDNA Testing

How to collect an eDNA sample:

The following steps are from the Great Australian Platypus Search: eDNA Water Sampling Tutorial and Safety Video by EnviroDNA and Odonata Foundation

Important - you do not need to enter the water to collect your sample. Entering the water prevents contamination of the sample.

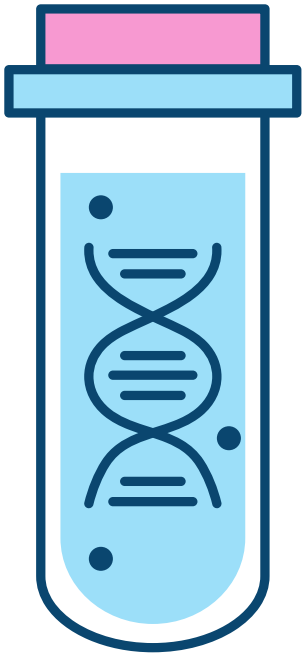
1. Open your sampling pack. In your pack you will have:
    i. A pair of gloves for you to wear that will help minimise any contamination.
    ii. Large syringe that will be used to sample the water.
    iii. Disc filters that are used to filter the water and capture DNA.
    iv. Smaller syringe with preservative.
2. Document the location of your sampling. This includes the name of the waterbody, the date of sampling and the name of the person doing the sampling. For some eDNA projects, you may also be given a site code which is used by researchers to identify the location you are sampling.
3. Put on your gloves.
4. Label each disc filter. You will collect two samples from your site so will need to label the disc filters 1 and 2.
5. Draw water out of the waterbody using your large syringe. Avoid sediment and algae as much as possible because these will clog the filter.

Background Information

eDNA Testing

How to collect an eDNA sample: Continued

6. Record the volume of water collected through the syringe. You may choose to adjust the amount of water in your sample to 50ml so that it is easy to calculate.
7. Screw on the disc filter to the top of the syringe.
8. Force the water in the syringe through the filter. The DNA will become trapped in the filter.
9. Repeat steps 5 to 8 until no more water can filter through. Be sure to document how much water you filter.
10. Remove excess water from the filter. Fill the syringe with air, screw on the filter and squeeze out any excess water.
11. Add the preservative to the disc filter. Adding the preservative helps to prevent degradation of the sample. Screw the disc filter with the sample onto the end of the small syringe and gently add the preservative into the filter.
12. Record the volume of water you filtered through the syringe into your data sheet.



Classroom Activities

ACTIVITY 1

(1A) Watch the following videos:

The first video from EnviroDNA explains what eDNA is and how it is used.

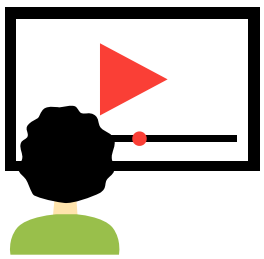
Link to video: https://www.youtube.com/watch?v=TQdTV1rAlWY&t=120s [Copy and paste into browser]

The second video from Odonata explains how eDNA is sampled from waterbodies as part of the Great Australian Platypus Search.

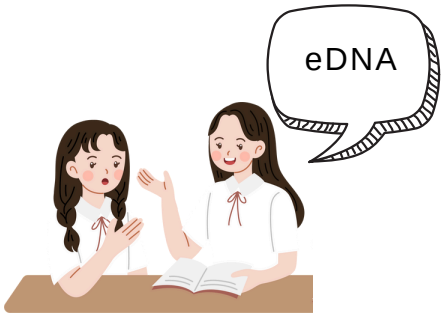
Link to video: https://www.youtube.com/watch?v=30G16kOFN7U&t=248s [Copy and paste into browser]

(1B) Discuss what you learnt from each video as a class. Write your ideas on the whiteboard.

(1C) Complete the Video Reflection worksheet.



Video



Discuss

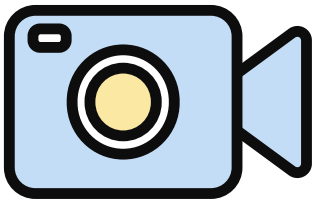
ACTIVITY 2

(2A) Research the species listed in the worksheet below and circle those that may be detected in the eDNA sample you collect from your local wetland.

Video Reflection

3

Three things I learnt while watching



2

Two questions I have from the video

1

One fact I found most interesting

What species are in your local wetland?

As a class, research the species listed below and circle those that may be detected in the eDNA sample you collect from your local wetland.

Tandanus tandanus

Retropinna semoni

Myuchelys purvisi

Chelodina longicollis

Neosilurus mollespiculum

Galaxias truttaceus

Elseya irwini

Notesthes robusta

Macquaria ambigua

Chelodina oblonga

Ornithorhynchus anatinus

Emydura macquarii

Maccullochella peelii

Rheodytes leukops

Nannoperca vittata

Carettochelys insculpta

Tandanus bostocki

Epidogalaxias salamandroides

Crinia pseudinsignifera

Chelodina expansa

Crinia glauerti

Litoria meiriana

Macquaria australasica

Lates calcarifer

Anguilla reinhardtii

Craterocephalus stercusmuscarum

Crocodylus johnsoni

Anguilla australis

Elusor macrurus

Elseya albagula

Classroom Activity

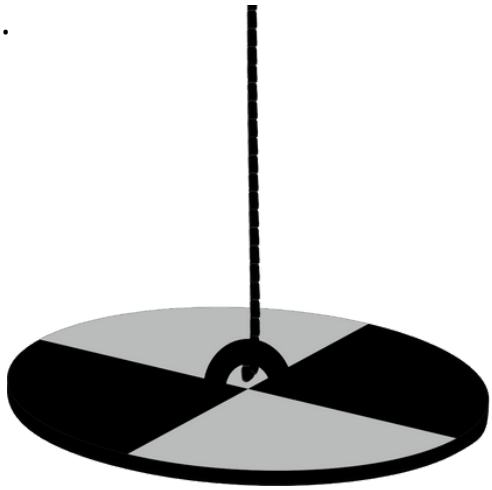
ACTIVITY 3

(3A) Make your own secchi disc! Watch the following video from the Chesapeake Bay NERR Virginia on how to make your own secchi disc.

Link to video: https://www.youtube.com/watch?v=sbQ2nVt_5GY

Equipment:

- Secchi disc design (on the following page).
- White plastic plate.
- Black sharpie and coloured sharpie.
- Hole punch.
- Eye bolt.
- Metal nuts and washers.
- Metal butterfly nut.
- Black tape.
- String.
- Tape measure.



Method:

1. Cut a 20cm diameter circle out of your plastic plate.
2. Draw a cross on your plate, dividing it into quarters.
3. Colour in two of the quarters black, using a black sharpie. You will need to colour in two sections which are diagonal to one another, like the image above.
4. Punch a hole in the centre of the plate.
5. Cover the top of the eye bolt with black tape.
6. Insert the eye bolt through the hole in the plate. The bottom of the eye bolt should be on the underside of your plate.
7. Feed on the nuts and bolts and secure with a butterfly nut.
8. Attach string to top of the eye bolt.
9. Lay out your string and measure 10cm up from the eye bolt using the black sharpie. Continue to mark 10cm intervals up the string. Mark 50cm intervals using a different colour sharpie.

Wetland Activity

ACTIVITY 1 - Water Quality Testing

(1A) In groups, conduct water quality testing at pre-selected locations (from lesson 1) around the wetland.

Equipment:

- Clipboards with recording sheets and experimental design
- GPS
- Gloves
- Water quality test kits (i.e. Pond Master Test Kit)
- Secchi disc.
- Waterproof thermometer.
- Hydrometer.

ACTIVITY 2 - eDNA Testing

(2A) Collect a sample of water from the wetland to be sent for eDNA analysis. Wear gloves when collecting the sample to prevent cross-contamination.

(2B) Follow the steps identified in the worksheet below.

Water Quality Monitoring

Aim:

Equipment:

- Water quality testing kits.
- Secchi disc.
- Waterproof thermometer.
- Hydrometer.
- Gloves.
- GPS.
- Recording sheets.

Method:

- Locate your site at the wetland., using the GPS coordinates you identified on Google Earth.
- Put gloves on.
- Test the water quality parameters identified in your experimental design.
- Record your results.
- Add any observations about your sampling or the site in the comments box.

Water Quality Recording Sheet

Date: Wetland Name:

Sampling site description:

Parameter	Result	Comments

Classroom Activity

ACTIVITY 4 -

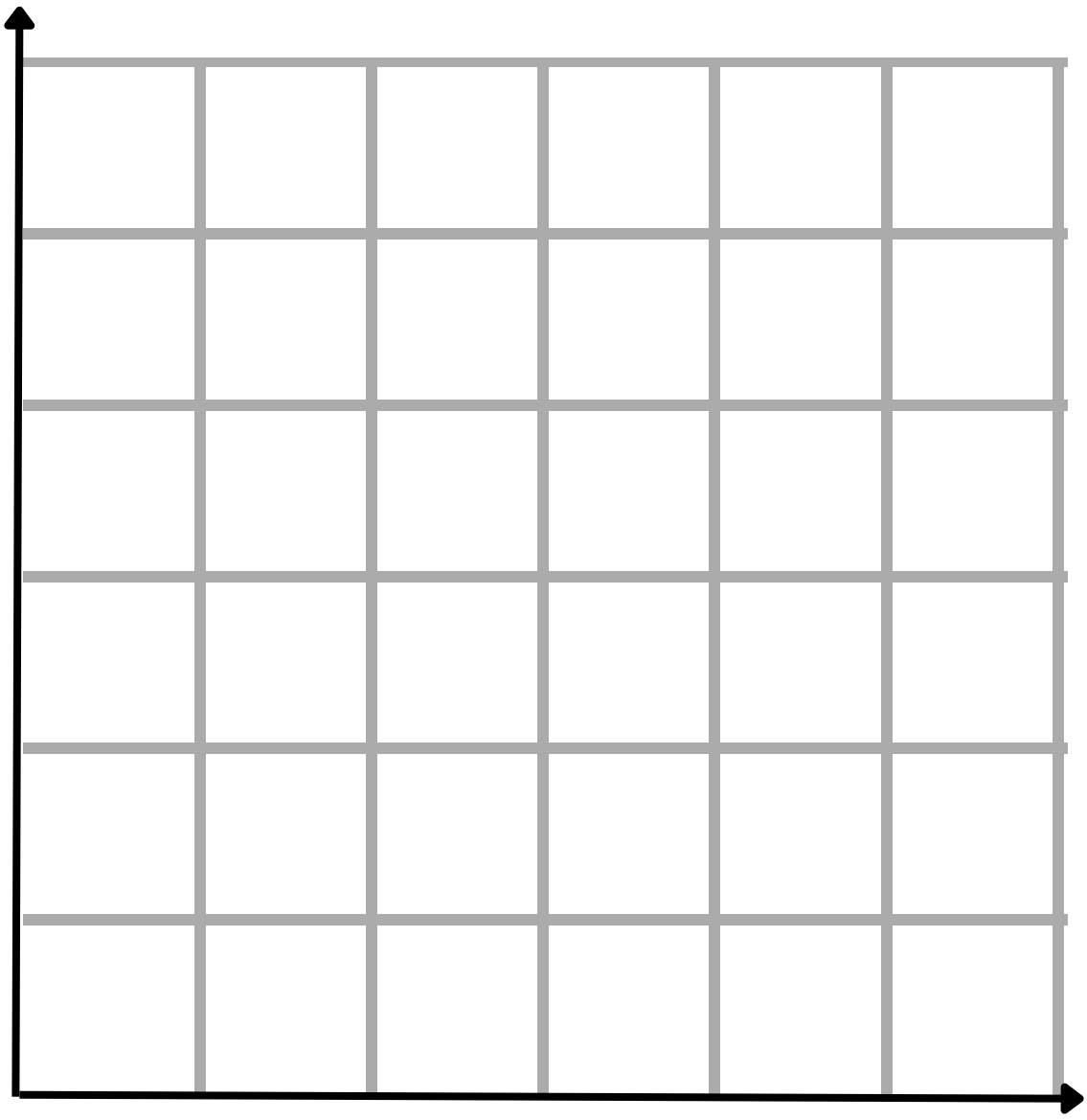
(4A) Revisit your experimental design and your research question.

(4B) Graph your data, based on your research question.
For instance, if you have sampled two sites and were interested in comparing the turbidity at the two sites, you may choose to create a bar graph of your data with one bar per site.

(4C) Interpret your findings and accept or reject your hypothesis based on your results.

Graph Your Data

Draw a graph of your water quality data.



Interpret your findings

Interpret your graph and answer your research question based on your data.

Do you accept or reject your hypothesis? Explain why.