LESSON

TERM THREE

WATER QUALITY PARAMETERS

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Photo credit: Marilyn Connell

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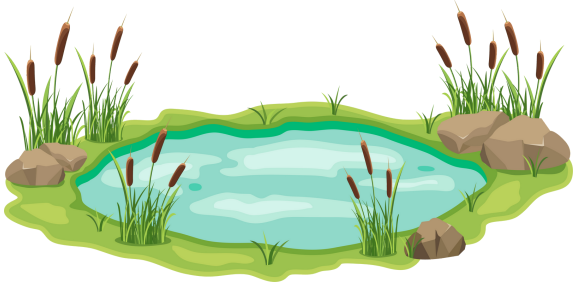
Learning Objectives

At the end of the lesson, students will be able to:

(1) Describe water quality parameters and explain how they relate to wetland health.

(2) Use applications (such as Google Earth) to plan scientific investigations, through the identification of sites for wetland sampling.

Describe



Identify

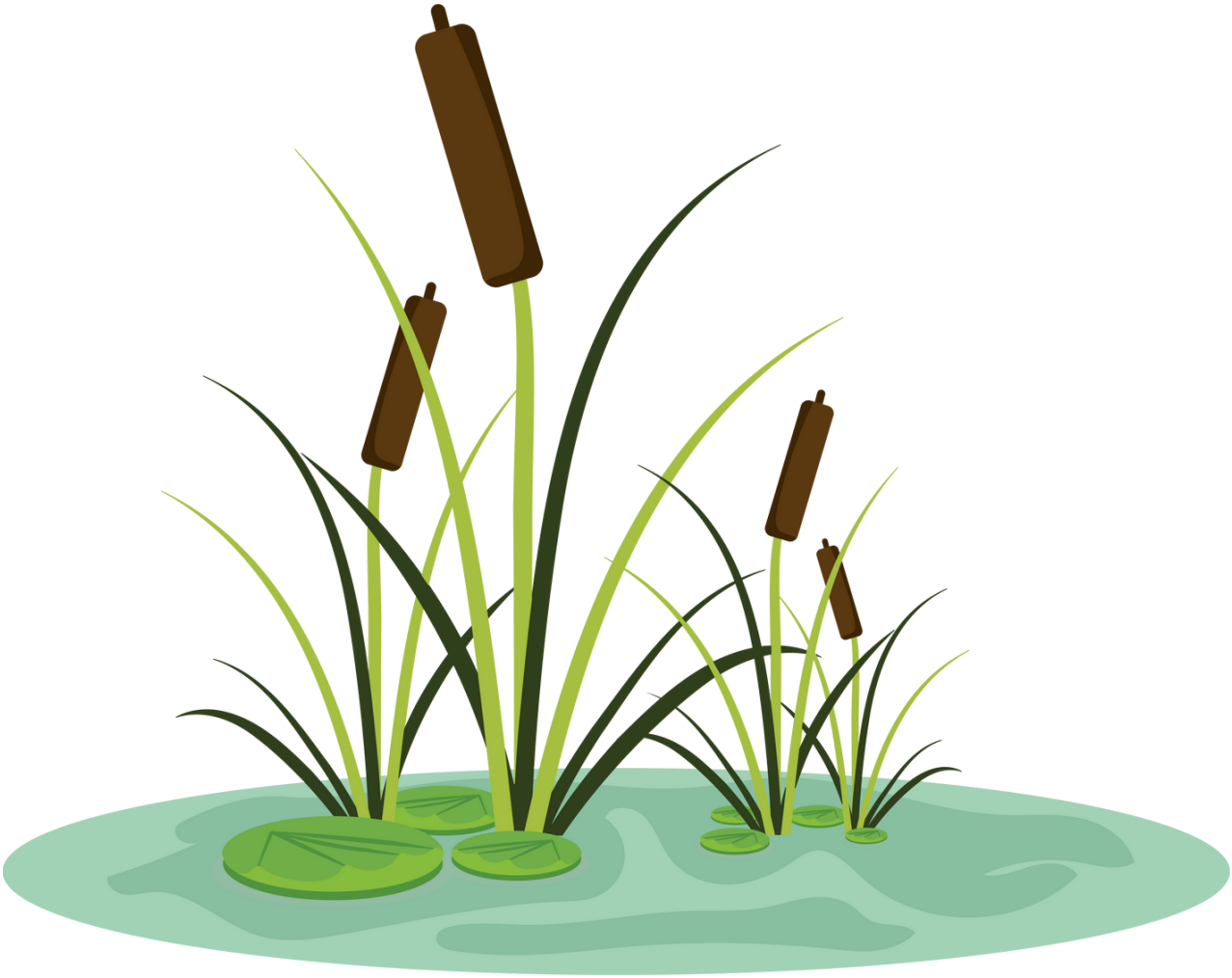
Background Information

Why do we test water quality?

Water quality testing can tell us how healthy the water is in our local rivers, creeks and wetlands.

The health of the aquatic habitat can be influenced by:

- Land clearing, agriculture, roadworks and erosion;
- Farming practices where fertilisers and pesticides leach into the water;
- Pollution;
- Weeds and feral animals which cause bank instability;
- Urban development (such as the construction of roads and suburbs).



Water quality parameters

pH:

pH is a measure of how acidic or alkaline the water is. The pH scale ranges from 0 to 14, with 7 classed as neutral, less than 7 classed as acidic and values greater than 7 classed as alkaline.

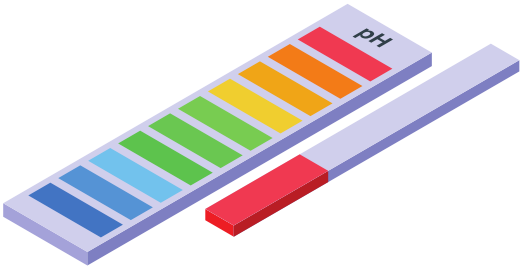
- Different aquatic organisms have specific pH ranges within which they thrive. Extreme pH levels (too acidic or too alkaline) can stress or harm aquatic life, affecting their physiology and behavior.

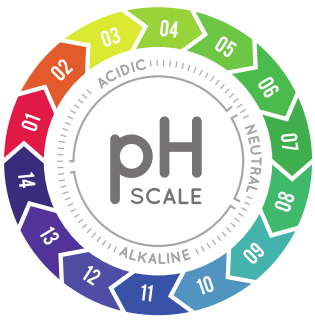
- pH affects various biological processes, including enzyme activity and microbial activity. These processes are crucial for nutrient cycling, organic matter decomposition, and overall ecosystem functioning.

- Many fish and invertebrate species are sensitive to pH changes. Acidic or alkaline conditions can interfere with their reproductive success, growth, and overall population dynamics.

- Changes in pH can be indicative of human activities, such as industrial discharges, acid rain, or agricultural runoff. Monitoring pH levels helps identify potential sources of pollution and guides remediation efforts.

- Drastic changes in pH can serve as an early indicator of ecosystem stress. Monitoring pH levels over time can help detect long-term trends and assess the overall health of the wetland.





Temperature:

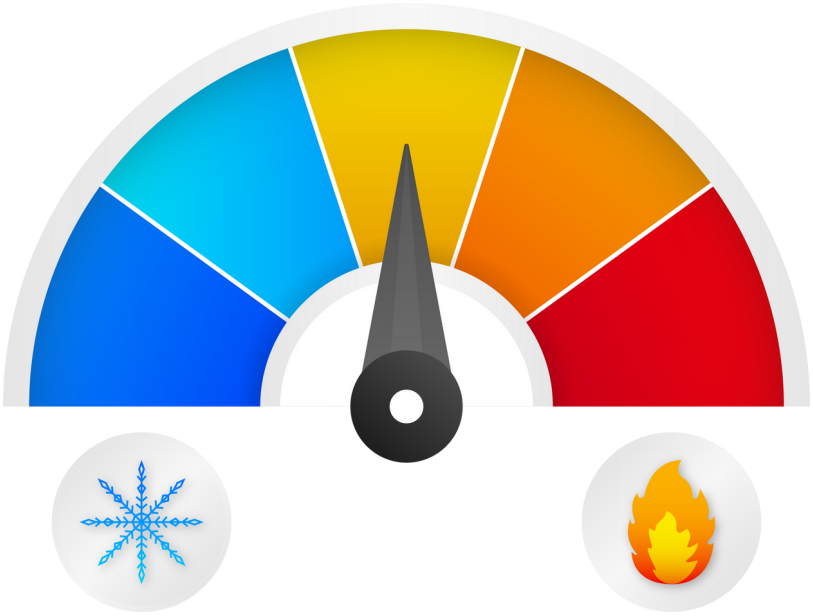
Temperature is how hot or cold the water is, and is measured in degrees Celsius. Measuring the temperature of a wetland is important because:

- Temperature directly affects the metabolic rates of aquatic organisms. Different species have optimal temperature ranges for growth and reproduction.

- Temperature affects the solubility of gases in water, including oxygen. As water temperature increases, its capacity to hold dissolved oxygen decreases. This is crucial for the survival of aquatic organisms, as they rely on dissolved oxygen for respiration.

- Temperature plays a role in determining the types of species that can thrive in a particular wetland. Some species are adapted to specific temperature ranges, and changes in temperature can influence the composition and diversity of the aquatic community.

- Long-term monitoring of water temperature in wetlands can serve as an indicator of climate change. Shifts in temperature patterns may affect the overall health and functioning of the wetland ecosystem.



Turbidity:

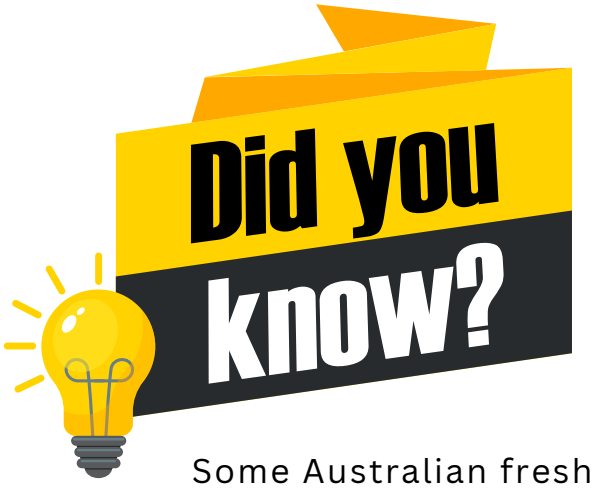
Turbidity measures how murky or cloudy the water is, and is usually caused by suspended particles.

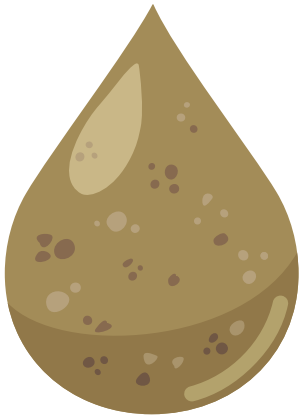
- High turbidity levels can reduce water clarity, potentially impacting light penetration and photosynthesis in aquatic plants.

- Suspended particles in turbid water can interfere with the feeding mechanisms of filter-feeding organisms (i.e. mussels). It may also reduce visibility, making it more challenging for predators to locate prey. Aquatic organisms adapted to clear water conditions may be negatively affected by increased turbidity.

- Turbidity can impact water temperature by affecting the absorption and reflection of sunlight. Changes in water temperature can, in turn, influence the metabolic rates of aquatic organisms.

- High turbidity levels can indicate increased erosion and runoff in the watershed. Monitoring turbidity helps assess the impacts of land-use changes, construction activities, or other factors contributing to sedimentation.





Some Australian freshwater turtles breathe through their cloaca. They are often referred to as “bum breathers”. These species rely on clear, highly-oxygenated water. Increased sedimentation may cause the species to rely on aerial breathing and increase exposure to predation and shorter dive durations.

Dissolved Oxygen:

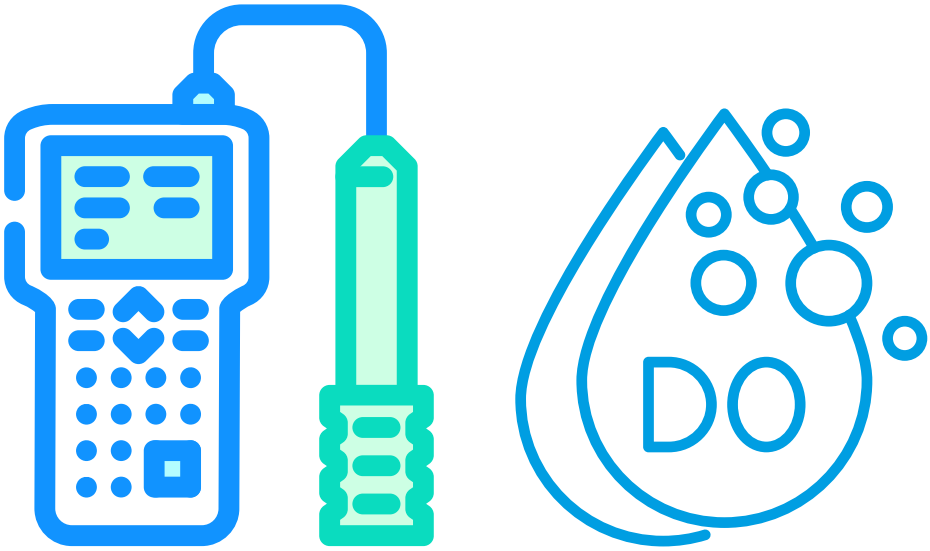
- Dissolved oxygen (DO) is crucial for the survival of aerobic organisms, including fish and many invertebrates. These organisms rely on oxygen for respiration.

- Temperature influences the solubility of oxygen in water. Warmer water has a lower oxygen-holding capacity. Monitoring dissolved oxygen levels is essential to ensure that they remain within suitable ranges for aquatic life.

- Low dissolved oxygen levels can be indicative of increased organic matter decomposition. Microorganisms breaking down organic material consume oxygen, potentially leading to hypoxic (low oxygen) or anoxic (no oxygen) conditions harmful to aquatic life.

- Anthropogenic pollutants, such as nutrient runoff or organic pollutants, can lead to oxygen depletion. Monitoring dissolved oxygen levels helps identify potential pollution sources and assess the overall health of the wetland ecosystem.

- Dissolved oxygen is essential for the microbial processes involved in nutrient cycling. Changes in oxygen availability can affect nutrient transformations, such as nitrogen cycling.



Salinity:

Salinity refers to the concentration of dissolved salts in water. Salinity can have significant implications for the health and functioning of aquatic ecosystems.

- Different species of aquatic organisms have varying tolerances to salinity levels. Some organisms, such as certain types of fish and invertebrates, are adapted to specific salinity ranges. Monitoring salinity helps assess the suitability of the habitat for these organisms.

- Salinity influences the osmotic regulation of aquatic organisms. Changes in salinity can affect the balance of water and salts within the cells of organisms.

- Salinity can influence the availability of nutrients in water. In some cases, high salinity levels can limit nutrient uptake by plants and microorganisms, potentially affecting the overall nutrient cycling within the wetland.

- Salinity can affect the types of plant species that can thrive in a wetland. Some plants are adapted to saline conditions, while others prefer freshwater. Changes in salinity can lead to shifts in vegetation composition and structure.

- Elevated salinity levels in wetlands can be indicative of human activities such as agriculture runoff, industrial discharges, or improper waste disposal. Monitoring salinity can help identify potential sources of pollution and guide conservation efforts.

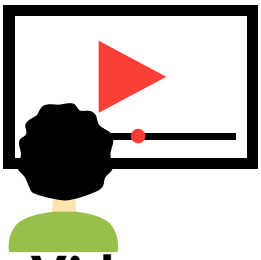
Classroom Activities

ACTIVITY 1

(1A) Watch the following video as a class. The video gives an example of water quality testing by the Environmental Protection Authority in Victoria.

Link to video: https://www.youtube.com/watch?v=94YcjbYBchc [Copy and paste into browser]

(1B) Initiate a class discussion about what students learnt from the video about water quality testing. Write the students ideas on the whiteboard.



Video

Discuss

ACTIVITY 2

(2A) Provide students with the water quality parameters worksheet to complete. This worksheet will tests the students' knowledge on what each parameter is measuring.

Classroom Activities

ACTIVITY 3

(3A) In preparation for Lesson 2, Term 3, student's use Google Earth to view their local wetland.

(3B) Students select sites for water quality sampling around their local wetland.

Australian Curriculum addressed in this Lesson

Science

Strand: Science Understanding (Year 5)

Sub-strand: Biological Sciences

AC9S5U01: examine how particular structural features and behaviours of living things enable their survival in specific habitats.

Sub-strand: Planning and conducting

AC9S5I02: plan and conduct repeatable investigations to answer questions including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place.

Strand: Science Understanding (Year 6)

Sub-strand: Biological Sciences

AC9S6U01: investigate the physical conditions of a habitat and analyse how the growth and survival of living things is affected by changing physical conditions.

Sub-strand: Planning and conducting

AC9S6I02: plan and conduct repeatable investigations to answer questions including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place.