Lesson: Native and Non-Native Plant Root Systems

Objective:

Students will learn about native and non-native plant root systems, their association with the water cycle, and understand the different types of root structures and their advantages. They will engage in an interactive activity to compare various root systems in terms of water absorption efficiency.

Competencies Covered:

- Demonstrate curiosity about the natural world
- Observe objects and events in familiar contexts
- Make observations about living and non-living things in the local environment
- Experience and interpret the local environment
- Identify First Peoples perspectives and knowledge as sources of information
- Compare results with predictions, suggesting possible reasons for findings
- Make simple inferences based on their results and prior knowledge
- Demonstrate an understanding and appreciation of evidence
- Identify some simple environmental implications of their and others' actions
- Transfer and apply learning to new situations
- Express and reflect on personal or shared experiences of place

Materials:

- Information sheet on native and non-native plant root systems (with attached infographics).
- Short fibrous/branching roots (cut straws in half)
- Long fibrous/branching roots (long thin straws)
- Short taproots (one short straw cut in half)
- Long taproots (one long straw)
- Water source
- Containers to hold water
- Worksheet for student predictions and observations
- Whiteboard or chart paper with markers

Background Information:

Plants play a crucial role in the natural world, supporting life by providing oxygen, food, and shelter to various organisms. But have you ever wondered how plants absorb water and stay nourished? Well, that's where their root systems come into

play! Today, we are going to explore the fascinating world of plant root systems and their connection to the water cycle.

The Water Cycle:

Before we dive into root systems, let's briefly review the water cycle. The water cycle is nature's way of recycling water on Earth. It involves processes like evaporation, condensation, precipitation, and runoff. When the sun heats up water bodies like lakes, rivers, and oceans, water turns into vapor and rises into the atmosphere. As it cools, it condenses to form clouds, and eventually, the water falls back to the Earth as rain, snow, or other forms of precipitation. This water is then absorbed by the soil and taken up by plants through their root systems.

Root Systems:

Root systems are a vital part of a plant's anatomy, hidden beneath the soil, anchoring the plant and absorbing water and nutrients from the ground. Just like we have different body structures for various purposes, plants also have different types of root systems suited to their specific needs.

1. Short Fibrous/Branching Roots:
    - Imagine a dense network of roots, like tiny branches, spreading out in all directions from the base of a plant. These are short fibrous/branching roots. They are commonly found in many native plant species. Their expansive root system helps them access water from a larger area, making them efficient at absorbing water during heavy rain or watering.
2. Long Fibrous/Branching Roots:
    - Similar to short fibrous roots, long fibrous roots have an extensive network, but their roots are longer and can penetrate deeper into the soil. These types of roots are also found in native plants and help them access water even during drier periods.
3. Short Taproots:
    - Imagine a single, thick root that grows straight down into the ground. That's a short taproot! It's like having a straw that reaches deep into the soil. Some native plants have short taproots, which are effective at accessing water deeper in the soil. However, they might struggle to absorb water from a wider area.
4. Long Taproots:
    - Just like short taproots, long taproots grow straight down into the ground, but they extend even deeper. Some non-native plants have long taproots, allowing them to access water in dry and arid regions where water might be scarce at the surface.

Importance of Root Systems:

Each type of root system has its advantages and disadvantages, depending on the environment and the plant's needs. In today's activity, we will simulate how different root systems work and compare their efficiency in moving water. By doing so, we can better understand why certain plants have evolved to have specific root systems and how they are adapted to survive in different conditions.

Procedure:

Introduction (15 minutes):

- Begin by discussing the water cycle briefly, explaining how water is essential for plant growth and how plants absorb water through their root systems.
- Introduce the concept of native and non-native plant species, explaining that native plants are indigenous to the region, while non-native plants have been introduced from other places.
- Provide the students with the information sheet about native and non-native plant root systems, highlighting the different types of root structures and their role in water absorption.
- Use the attached infographics to assist in visually representing the root systems.

Pre-Activity Predictions (10 minutes):

- Engage the students in a class discussion, asking the questions mentioned in the activity description, such as:
    - Who can move the water the fastest?
    - Who can move the most water?
    - What type of root would you say is the most efficient at regulating the underground water?
    - What type of roots do you remember some of our native plants having?
    - What type of roots do you remember some of our non-native plants having?
- Allow students to make predictions based on the information provided.

Root System Activity (20 minutes):

- Divide the class into four groups and assign each group a specific root system (short fibrous/branching roots, long fibrous/branching roots, short taproots, long taproots).
- Provide each group with the corresponding type of root (cut straws) and a container filled with water.
- Instruct the students to use the straws to suck up as much water as they can and transfer it to another container.

- Students should work as a team, and once they cannot transfer any more water, they stop and claim to be done.
- Observe and note the speed and efficiency of each group's water transfer.

Post-Activity Reflection (15 minutes):

- Gather the students and discuss the outcomes of the activity.
- Ask the questions from the pre-activity predictions again and compare the answers to the actual results.
- Encourage students to share their thoughts on why certain root systems performed better or worse in the activity.
- Discuss the advantages and disadvantages of each type of root system, relating them to the specific needs of different plants.

Conclusion (10 minutes):

- Summarize the main points of the lesson, emphasizing the importance of understanding root systems for the survival of plants and their connection to the water cycle.
- Have a brief Q&A session to clarify any remaining doubts or questions.
- Assign a worksheet for students to complete individually, where they can draw and label different types of root systems and explain their roles in water absorption.

Assessment:

The students' understanding can be assessed through their active participation in the root system activity, their ability to answer the pre-activity and post-activity questions, and their completion of the assigned worksheet. The teacher can also gauge their comprehension through classroom discussions and individual interactions during the lesson.

Native and Non-Native Root Comparison Chart

Root depths of species commonly found in the Frazer Valley area

Root Types

Taproots

Taproots are thick and long with one main root that grows straight down.

They provide more stability to plants. This helps them stand upright even in strong winds or heavy rain.

Taproots are great for surviving in dry areas because they grow deep into the soil to find water and store it their thick roots.

Fibrous

Fibrous roots are a bunch of small, thin roots that spread out in different directions.

They are good at holding the soil together, preventing erosion.

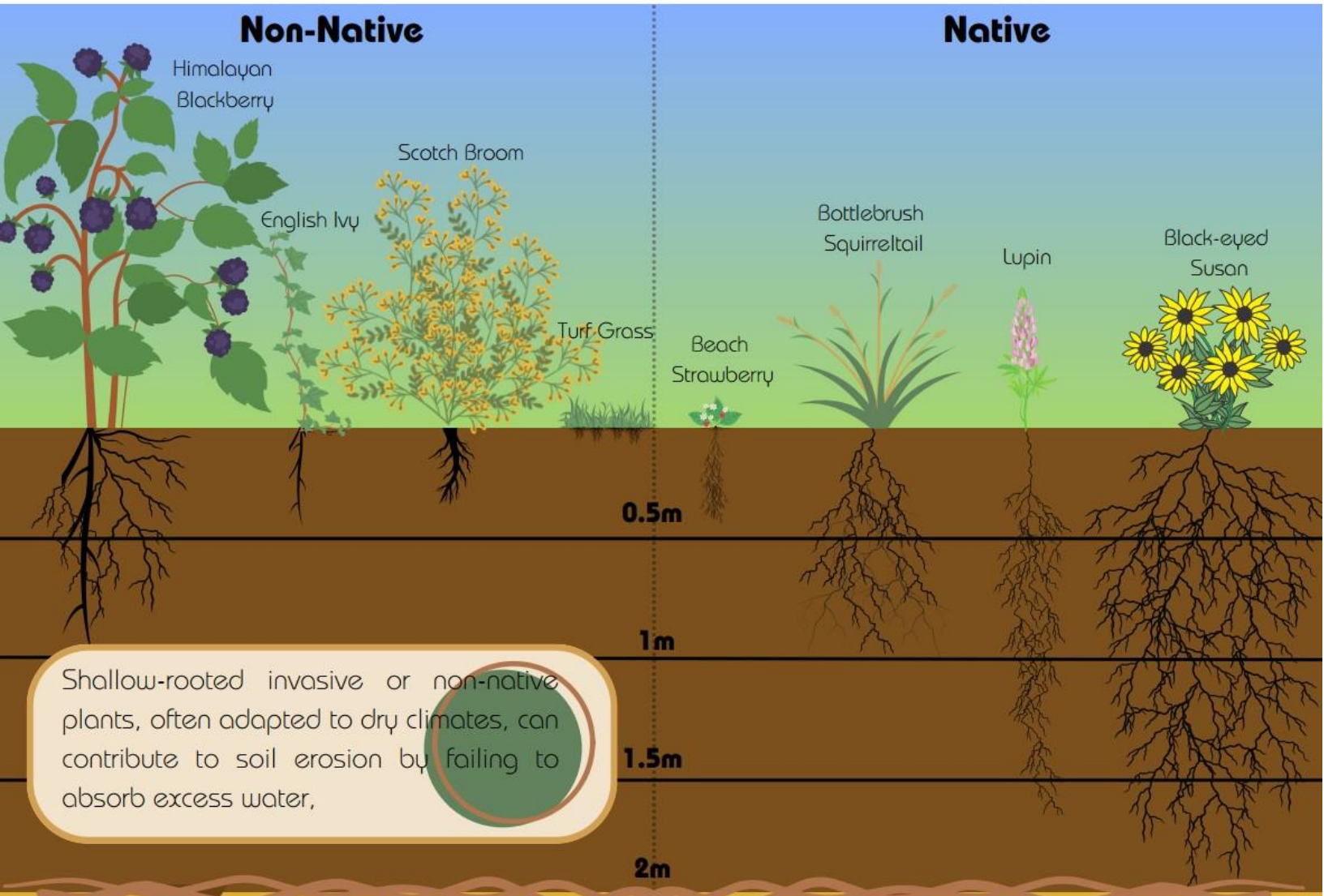
These roots spread out near the surface, which helps them absorb water quickly after rain.

Fibrous roots are more adaptable to wetter environments and help prevent the plant from getting waterlogged.

Native and Non-Native Root Comparison Chart

Root depths of species commonly found in the Frazer Valley area

Root Systems



Shallow-rooted invasive or non-native plants, often adapted to dry climates, can contribute to soil erosion by failing to absorb excess water,

BEACH STRAWBERRY

Beach strawberries are essential for soil and water maintenance in coastal areas. They absorb water quickly in sandy soil, prevent erosion with spreading runners, and keep the soil cool and moist with their dense canopy.

LUPIN

Lupins play a vital role in soil and water maintenance. Their special bacteria convert air nitrogen into plant nutrients, while their deep roots store water, create channels, and prevent erosion, benefiting other plants and animals.

BOTTLEBRUSH SQUIRRELTAIL

Bottlebrush squirreltails are important for soil and water maintenance. Their spreading roots prevent erosion, absorb water, and release it gradually, protecting against flooding and benefiting other plants and animals.

BLACK-EYED SUSAN

Black-eyed Susans are important for soil and water maintenance. Their deep roots help absorb excess water, preventing flooding and erosion. They also absorb nutrients, enriching the soil for other plants.