Pine Plantation Forestry

EDUCATORS TOOLKIT

NEW ZEALAND EDITION

Year 1 - Year 4

SowtheSeed AGRICULTURAL & HORTICULTURAL SCIENCE ADVISORY TEAM
Rabobank
EDUCATING KIDS ABOUT AGRICULTURE
ppsa PRIMARY PRODUCERS SA
Australian Government Department of Agriculture, Water and the Environment
DELIVERED BY: AU2100
FOOD & FIBRE EDUCATION SA

Acknowledgments

This online curriculum-linked resource was produced by George the Farmer Pty Ltd for Primary Producers SA (PPSA). This project is supported by the Department of Agriculture, Water and the Environment, through funding from the Australian Government's 'Educating Kids About Agriculture Initiative'.

This curriculum resource has been adapted to the New Zealand Curriculum by Sow the Seed and supported by Rabobank.

References

New Zealand Ministry of Education. New Zealand Curriculum. Retrieved from https://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum

Creative Commons (2013) Creative Commons. Retrieved from http://www.creativecommons.org/licenses/by/3.0/au/deed.en

Crockett, L. & Jukes, I. & Churches, A. (2011) Literacy is not enough. 21st Century Fluency Project Inc.

ForestLearning. https://forestlearning.edu.au/

MacPherson, S. (2020) Local Safari. Wildlife Adventures at Home. The Jane Goodall Institute Australia.

Table of contents

Introduction

This George the Farmer Educational Resource aims to raise awareness about plantation forests resources, management, the interrelationships within plantation forests, and farming forests.

PLANTATION FORESTS

Plantation forests are of great value, as they make an economic contribution to the country from timber production and employment, while also contributing to catchment protection, recreation, and climate improvement.

A message from George!

Plantations are intensively managed stands of trees that have been planted to produce wood.

Growing trees in plantations is just like growing a crop of wheat or barley. Except instead of harvesting one crop a year, trees in plantations can take up to 28 years before they reach the right height and diameter for mills to process them into timber or the right size for export typically to China. The people who grow and manage these forests are known as foresters.

New Zealand's plantation forests supply most of the structural timber used in New Zealand. A significant proportion of the paper products are imported from other international plantation forests and used by New Zealanders. The forests are considered some of the most sustainable in the world.

The wood produced in plantations is all around us! Timber is used for the building of homes and schools, furniture and in outdoor spaces. Paper and cardboard is used by homes, schools, and offices all around the country.

Foresters are responsible for managing the forest cycle from seed to harvest. Carefully selected seeds are germinated in a nursery and planted by hand in prepared soil in higher rainfall months. Foresters monitor and manage the forests for weeds, pests and nutrition using high tech equipment like LiDAR and drones. They remove poorly formed trees through thinning operations once or twice in their 28-year rotation. This allows more sunlight and reduces competition for nutrients and water for the remaining well-formed healthy trees so that they can grow taller and wider faster.

The logs harvested from thinning operations are used to make products like farm fence posts and fibre – nothing is ever wasted. Fibre is growing in importance, especially with the growing importance of biofuels. Foresters then manage the harvest operations before the logs head to the mill for processing or ship for export.

Plantation forests are either planted with cone bearing softwoods, like pines, or flowering native hardwoods, like eucalyptus. The most commonly grown commercial plantation tree species in New Zealand is radiata pine, Pinus Radiata.

Radiata pine is a native tree of North America, growing naturally in a very small area of the west coast. Radiata pine trees are valued for being fast growing, reaching up to 50 metres in height by 30

continued over page >

years of age, as well as providing a great source of construction timber for building and construction as well as wood pulp for the paper industry.

New Zealand scientists (Radiata Pine Breeding Company) have worked over many years to improve the genetics of this tree to New Zealand growing conditions that has seen great improvements to growth rates, tree form (straightness and uniformity), and other criteria.

Radiata pine trees have dark brown bark, produce pinecones for reproduction, and their leaves are thin green needles. They can grow in a wide range of soil types and fertility, temperature, elevation and rainfall than most other tree species.

Being softwood pine trees, these trees reproduce in their natural environment via male and female pinecones. Female pinecones form on the higher branches of mature trees and are fertilised by minute, yellow, wind-borne pollen grains released from the male pinecones. Mature pinecones open in hot, dry conditions and release seeds. Seedlings are also grown in large nurseries for replanting. As in New Zealand, we don't rely on natural reproduction how else would we get our nice rows of trees?

Did you know that a forest is much more than a group of trees used for producing wood? Our plantation forests provide a wide range of purposes, services, facilities and amenities.

Forests:

- Are habitats for a wide variety of flora and fauna.
- Produce the renewable resource of wood.
- Are used for recreation and protect water catchment areas.
- Play an important role in keeping the Earth's atmosphere clean.
- Play an important role in regulating the greenhouse effect by absorbing and storing carbon from the atmosphere in their wood.
- Meet world recognised criteria that allows them to become certified as sustainably managed to ensure they remain healthy for all generations to come.
- Are a vital resource for people in New Zealand and elsewhere.
- Provide materials, products, jobs, spaces for recreation as well as protecting Māori cultural sites and practices.

Resource description

This George the Farmer educational resource is intended as starting points for a cross-curricular approach to learning, based on the George the Farmer YouTube video "George the Farmer Forestry" **https://youtu.be/9V_f4P4bYNE** and its accompanying Virtual Reality (VR) experience 'George the Farmer Forestry VR' on YouTube **https://youtu.be/ywRlqdUet-8** or through the FarmVR app: **https://farmvr.com**. Classes are encouraged to look at the video, the VR and read the lyrics to the song included in this resource. Follow up this guide with the Sustainable Forest Plantations educators resource.

The activities seek to complement and extend the enjoyment students will experience from seeing the video and VR, whilst at the same time meeting some of the requirements of curriculum outcomes. The activities in this resource can be printed out for students, or alternatively, display the activity page from the PDF on your electronic white board and have the students use their existing workbooks to complete the task.

The activities in this resource can be printed out for students, or alternatively, display the activity page from the PDF on your interactive white board or import an activity page into your online teaching and learning environment such as Google Slides and have the students use their existing workbooks to complete the task.

Curriculum focus

The guide is divided into a series of English, Science, Technology, and Mathematics activities aimed at students between the ages of 4 and 8 years. The activities are also suitable for teachers and students in early childhood and care settings such as long day care services, preschools, kindergartens, and outside school hour care services.

New Zealand Curriculum Connections

Level 1

Technology

Technological Practice

Students will:

Planning for practice

- Outline a general plan to support the development of an outcome, identifying appropriate steps and resources.

Brief development

- Describe the outcome they are developing and identify the attributes it should have, taking account of the need or opportunity and the resources available.

Outcome development and evaluation

- Investigate a context to communicate potential outcomes. Evaluate these against attributes; select and develop an outcome in keeping with the identified attributes.

Technological Knowledge

Students will:

Technological modelling

- Understand that functional models are used to represent reality and test design concepts and that prototypes are used to test technological outcomes.

Technological products

- Understand that technological products are made from materials that have performance properties.

Technological systems

- Understand that technological systems have inputs, controlled transformations, and outputs.

Nature of Technology

Students will:

Characteristics of technology

- Understand that technology is purposeful intervention through design.

Characteristics of technological outcomes

- Understand that technological outcomes are products or systems developed by people and have a functional nature and a physical nature.

Science

Nature of Science

Students will:

Understanding about science

- Appreciate that scientists ask questions about our world that lead to investigations and that open-mindedness is important because there may be more than one explanation.

Investigating in science

- Extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

Communicating in science

- Build their language and develop their understanding of the many ways the natural world can be represented.

Participating and contributing

- Explore and act on issues and questions that link their science learning to their daily living.

Living World

Students will:

Life processes

- Recognise that all living things have certain requirements so they can stay alive.

Ecology

- Recognise that living things are suited to their particular habitat.

Material World

Students will:

Properties and changes of matter

- Observe, describe, and compare physical and chemical properties of common materials and changes that occur when materials are mixed, heated, or cooled.

Chemistry and Society

- Find out about the uses of common materials and relate these to their observed properties.

English

Listening, Reading and Viewing

Processes and strategies

Students will:

- Acquire and begin to use sources of information, processes, and strategies to identify, form, and express ideas.

Purposes and audiences

Recognise that texts are shaped for different purposes and audiences by:

- Identifying the purposes of simple texts;
- Evaluating the usefulness of simple texts.

Ideas

Recognise and identify ideas within and across texts by:

- Understanding that personal experience can influence the meaning gained from texts;
- Making meaning of texts by identifying ideas in some texts.

Language Features

Recognise and begin to understand how language features are used for effect within and across texts by

- Beginning to recognise that oral, written and visual language features can be used for effect
- Recognising some topic specific words.

Structure

Recognise and begin to understand text structures, by:

- Understanding that the words, sentences and images contribute to text meaning;
- Recognising some text forms and some differences between them.

Speaking, Writing and Presenting

Processes and strategies

Students will:

Acquire and begin to use sources of information, processes and strategies to identify, form and express ideas.

Purposes and audiences

Recognise how to shape texts for a purpose and an audience, by:

- Constructing texts that demonstrate some awareness of purpose and audience through the choice of content, language and text form;
- Expecting the texts they create to be understood, responded to and appreciated by others;
- Developing and conveying personal voice where appropriate.

Ideas

Form and express ideas on a range of topics, by:

- Forming and expressing simple ideas and information;
- Beginning to support ideas with some detail.

Language features

Use language features, showing some recognition of their effects, by:

- Using some oral, written and visual language features to create meaning and effect;
- Using a range of high-frequency, topic-specific and personal-content words to create meaning.

Structure

Organise texts, using simple structures, by:

- Using knowledge of word and sentence order to communicate meaning in simple texts;
- Beginning to sequence ideas and information;
- Using simple sentences with some variation in beginnings;
- Attempting compound and complex sentences.

Mathematics

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

Number and Algebra

Number strategies

- Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions.

Number Knowledge

- Know the forward and backward counting sequences of whole numbers to 100.

Statistics

Statistical Investigation

- Conduct investigations using the statistical enquiry cycle:
  - posing and answering questions;
  - gathering, sorting and counting, and displaying category data;
  - discussing the results.

Statistical Literacy

- Interpret statements made by others from statistical investigations and probability activities.

Geometry and Measurement

Measurement

- Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units.

Level 2

Technology

Technological Practice

Students will:

Planning for practice

- Develop a plan that identifies the key stages and the resources required to complete an outcome.

Brief development

- Explain the outcome they are developing and describe the attributes it should have, taking account of the need or opportunity and the resources available.

Outcome development and evaluation

- Investigate a context to develop ideas for potential outcomes. Evaluate these against the identified attributes, select, and develop an outcome. Evaluate the outcome in terms of the need or opportunity.

Technological Knowledge

Students will:

Technological modelling

- Understand that functional models are used to explore, test, and evaluate design concepts for potential outcomes and that prototyping is used to test a technological outcome for fitness of purpose.

Technological products

- Understand that there is a relationship between a material used and its performance properties in a technological product.

Technological systems

- Understand that there are relationships between the inputs, controlled transformations, and outputs occurring within simple technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand that technology both reflects and changes society and the environment and increases people's capability.

Characteristics of technological outcomes

- Understand that technological outcomes are developed through technological practice and have related physical and functional natures.

Science

Nature of Science

Students will:

Understanding about science

- Appreciate that scientists ask questions about our world that lead to investigations and that open-mindedness is important because there may be more than one explanation.

Investigating in science

- Extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

Communicating in science

- Build their language and develop their understanding of the many ways the natural world can be represented.

Participating and contributing

- Explore and act on issues and questions that link their science learning to their daily living.

Living World

Students will:

Life processes

- Recognise that all living things have certain requirements so they can stay alive.

Ecology

- Recognise that living things are suited to their particular habitat.

Evolution

- Recognise that there are lots of different living things in the world and that they can be grouped in different ways.

Material World

Students will:

Properties and changes of matter

- Observe, describe, and compare physical and chemical properties of common materials and changes that occur when materials are mixed, heated, or cooled

Chemistry and society

- Find out about the uses of common materials and relate these to their observed properties.

English

Listening, Reading and Viewing

Processes and strategies

Students will:

Select and use sources of information, processes and strategies with some confidence to identify, form and express ideas, by:

Purposes and audiences

Show some understanding of how texts are shaped for different purposes and audiences, by:

- Recognising how texts are constructed for different purposes, audiences and situations;
- Understanding that texts are created from a particular point of view;
- Evaluating the reliability and usefulness of texts with some confidence.

Ideas

Show some understanding of ideas within, across and beyond texts, by:

- Using their personal experience and world and literacy knowledge to make meaning from texts;
- Making meaning of increasingly complex texts by identifying main ideas;
- Making and supporting inferences from texts with some independence.

Language features

Show some understanding of how language features are used for effect within and across texts, by:

- Recognising that oral, written and visual language features can be used for effect;
- Using a large and increasing bank of high-frequency, topic-specific, and personal-content words to make meaning;
- Showing an increasing knowledge of the conventions of text.

Structure

Show some understanding of text structures, by:

- Understanding that the order and organisation of words, sentences, paragraphs and images contribute to text meaning;
- Recognising an increasing range of text forms and differences between them.

Speaking, Writing and Presenting

Processes and strategies

Students will:

Select and use sources of information, processes, and strategies with some confidence to identify, form and express ideas.

Purposes and audiences

Show some understanding of how to shape texts for different purposes and audiences, by:

- Constructing texts that demonstrate a growing awareness of audience and purpose through appropriate choice of content, language and text form;
- Expecting the texts they create to be understood, responded to, and appreciated by others;
- Developing and conveying personal voice where appropriate.

Ideas

Select, form, and express ideas on a range of topics, by:

- Forming and expressing ideas and information with reasonable clarity, often drawing on personal experience and knowledge;
- Beginning to add or delete details and comments, showing some selectivity in the process.

Language features

Use language features appropriately, showing some understanding of their effects, by:

- Using oral, written and visual language features to create meaning and effect;
- Using a large and increasing bank of high-frequency, topic-specific, and personal-content words to create meaning;
- Writing legibly and with increasing fluency when creating texts;
- Gaining increasing control of text conventions, including some grammatical conventions.

Structure

Organise texts, using a range of structures, by:

- Using knowledge of word and sentence order to communicate meaning when creating text;
- Organising and sequencing ideas and information with some confidence;
- Beginning to use a variety of sentence structures, beginnings, and lengths.

Mathematics

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

Statistics

Statistical investigation

- Conduct investigations using the statistical enquiry cycle:
  - posing and answering questions;
  - gathering, sorting, and displaying category and whole-number data;
  - communicating findings based on the data.

Statistical literacy

- Compare statements with the features of simple data displays from statistical investigations or probability activities undertaken by others.

Geometry and Measurement

Measurement

- Create and use appropriate units and devices to measure length, area, volume and capacity, weight (mass), turn (angle), temperature, and time.
- Partition and/or combine like measures and communicate them, using numbers and units.

SONG

Don’t you know that wood is good for the world!

VERSE 1

Long long rows of trees just doing their thing
Growing straight and tall hear the bird sing
Pine and blue gums are some of the trees that we use
Merbau, Oak and Jarrah hardwoods are too

CHORUS

Don’t you know that trees are good for the world
Don’t you know that wood is good for the world

VERSE 2

Forests take the carbon out of the air
It’s great for us and the world that we share
The word is a fun one to say
Carbon sequestration is saving the day

CHORUS

Don’t you know that trees are good for the world
Don’t you know that wood is good for the world

VERSE 3

The trucks and harvesters have got a big job
To cut and trim and load all that wood
It takes a lot of people doing all of that work
To grow our trees and turn it into straight wood

CHORUS

Don’t you know that trees are good for the world
Don’t you know that wood is good for the world

VERSE 4

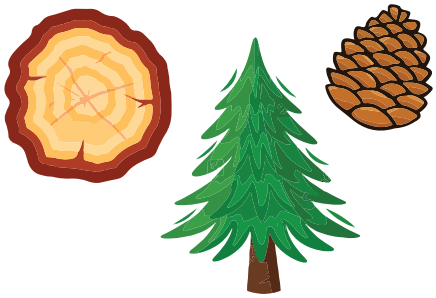
Milling trees into the timber we use
To build all kinds of things with hammers and nails
Fences, kennels, sheds and frames for our home
Timber is a great material to use

CHORUS

Don’t you know that trees are good for the world
Don’t you know that wood is good for the world

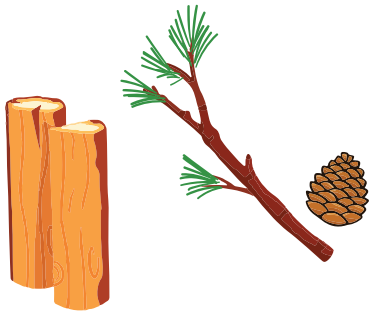
ACTIVITY 1

Explore Plantation Forests



Recall the video in which George the Farmer learns all about forestry.

Can you remember the variety of things you saw in the video and where things happened?



Draft a storyboard for a video or podcast and record your video or podcast to share it with others!

Video/podcast title

Video/podcast setting

Characters in the video

Season

The video/podcast narrative

ACTIVITY 1

Share what you know about where wood comes from and the people who produce it.

Explain what foresters do.

ACTIVITY 1

Complete a survey. Talk to family members or friends and then draw a small picture for each activity that they have done in a forest.

The plantation forests my family or friend has visited is called: _____

They/we have:

Gone for a bushwalk	**Had a picnic**
Ridden bikes	**Looked at the trees**
Gone camping	**Walked the dog**
Horse riding	**Other ideas**

ACTIVITY 1

Spot the plantation forest features.

Which ones are human-made and which ones are natural features of forests?

Play the video again and count the number of times you see items listed below.

Pathways	**Pine trees (Pinus Radiata)**
Fallen logs	**Pine cones**
Machines	**Access roads**
Foresters	**George the Farmer**

ACTIVITY 1

Features of plantation forests.

Draw 4 things that you can find in plantation forests that are native.

Draw four things that you can see in forests that people have made.

ACTIVITY 1

Investigate plantation forests.

Can you recall what plantation trees are used for? Complete the sentences.

A plantation forest is used for producing...

Plantations are forests of...

The people who look after plantations are called...

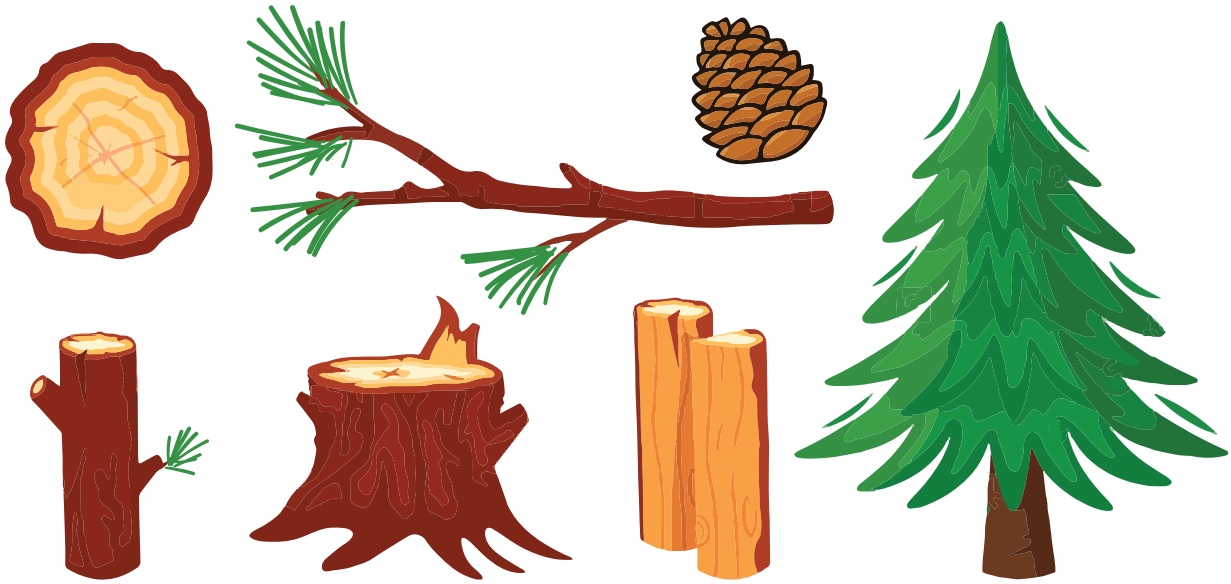
Foresters have to know all about the way that trees...

Forestry plantations are...

Pinus Radiata or Radiata Pine is....

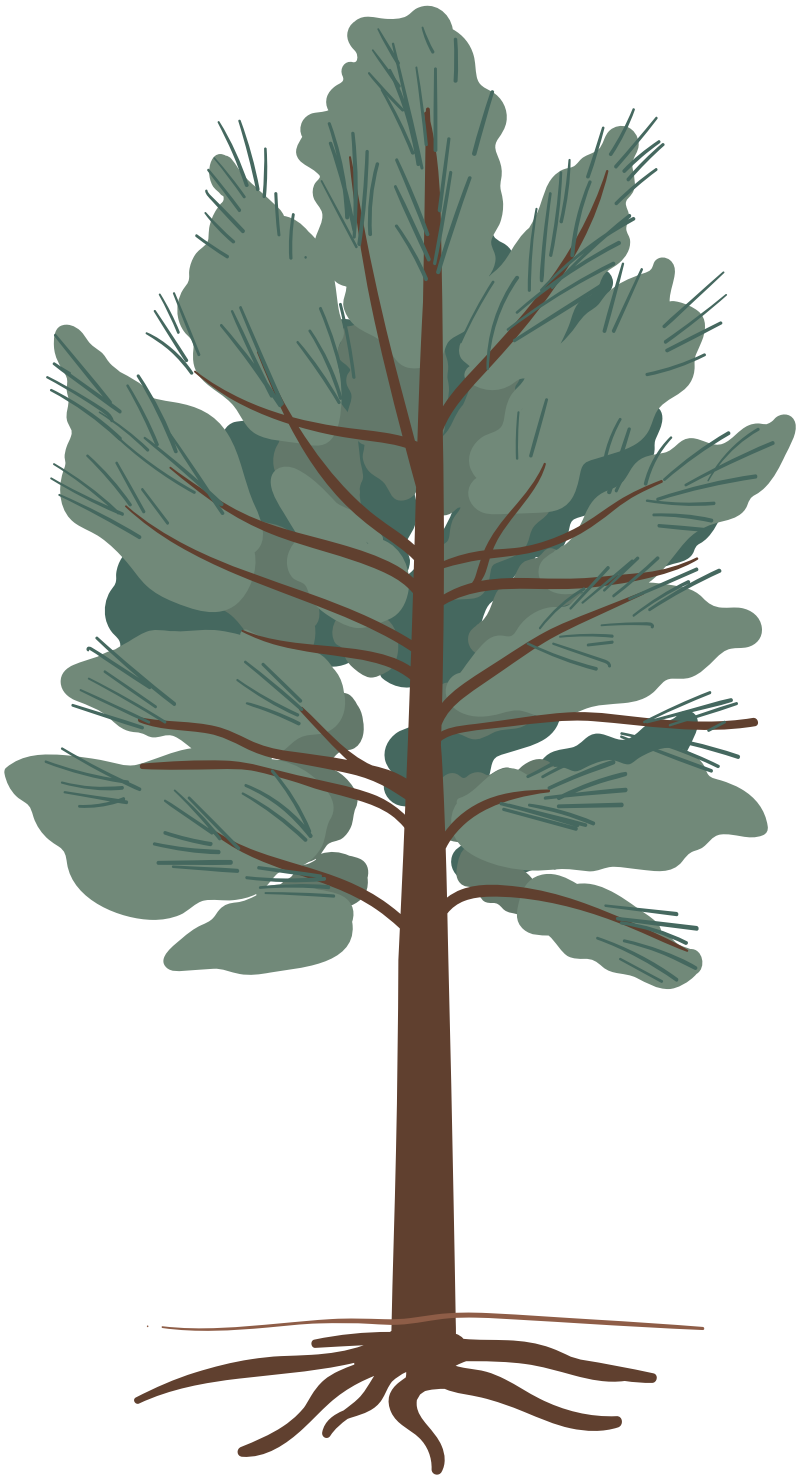
ACTIVITY 1

Create a dictionary.



Label each of the features above. Make a dictionary of words relating to the external features of plantation trees grown in New Zealand plantation forests.

Body structures of trees



Did you know that trees need air, water and light to make their food to enable them to grow, and that each part of a tree has a special job to do?

Roots

Locate the roots of the tree in the picture. Roots grow beneath the surface of the soil and act as an anchor to hold the tree in place. Roots absorb water and nutrients from the soil through tiny root hairs.

Let's experiment

Experiment with a weed to see how the roots hold the weed in the soil. Just like weeds, trees carry nutrients and water from the soil to the tree.

Place weeds with roots in bottles with and without water and observe and record what happens in the space on the next page.

ACTIVITY 1

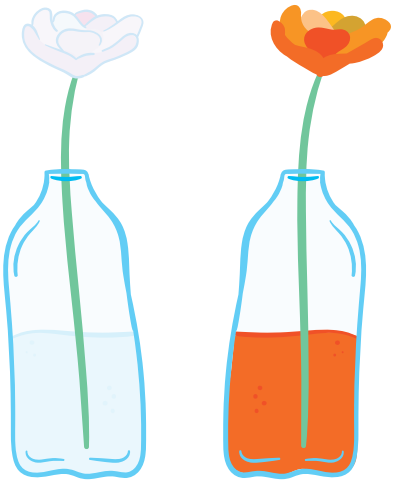
Place weeds with roots in bottles with and without water and observe and record what happens below.

Trunks

What part of a tree might be its trunk? Locate and label the trunk on the picture of the tree on page 19.

What covers the outer layer of the trunk of the tree? What might be inside a tree trunk?

Did you know that the trunk is the main stem of a tree and it supports the crown of the tree (branches and leaves)? Most timber comes from the tree trunk and within the trunk are tubes that transport water from the roots upwards and others that carry down the food formed in the leaves. The trunk also has many layers.



Let's experiment

Experiment with stems of a plant to learn more about tree trunks.

Using white long-stemmed flowers, one bottle of water and one bottle of coloured water, place the flowers in each bottle and predict what might happen.

My prediction

ACTIVITY 1

Branches

Using the picture of the Radiata pine tree on page 19, locate and label its branches.

Write about what the function of tree branches might be.

Leaves and needles

Do you know what type of tree has needles?

What type of tree has needles? Draw what the needles look like in the space below.

The leaves and needles need light, air, and water to make food.

How might the trees get their water and air?

ACTIVITY 1

Let's experiment

Using a magnifying glass, look at the underside of a range of different leaves. Can you see any tiny holes? These are called stomata and they take in the air.

Do you think leaves might make food without light, air, and water?

Record your prediction.

My prediction

Take a punnet of seedlings and explore how a seedling might grow without light. Plant a seedling in a jar with some water, screw the lid on tight, and then place it in a black plastic bag. Check the results after five days.

The results

Why might this have happened? What did the seedling lack?

Many important processes take place in the leaves of trees: Photosynthesis uses energy from the sun to produce food for a tree. Respiration and transpiration keep the tree cool.

Flowers, pods, cones, and fruits

Most trees start life as a seed.

Trees which have seeds in fruits are called angiosperms and trees which have no flowers and produce seeds in cones are called gymnosperms.

Seeds are formed after pollination. In angiosperms, flowers are pollinated by insects, water, wind and by animals, and gymnosperms are pollinated by wind moving through the pollen.

ACTIVITY 2

Design a PowerPoint presentation

Plantations are forests of trees which are planted to produce wood. Plantation forestry is like farming. In forestry, trees are the crop being grown to produce wood or timber.

View the George the Farmer forestry video about plantation forests and the different uses for wood sourced from these forests.

Record what species of trees are best for producing cardboard and paper, tissues, pine bark, pulp wood, and timbers used in housing construction.

Your challenge is to design and produce a PowerPoint presentation.

Recall the ways foresters manage plantation forests sustainably and include slides about how the aim of foresters is to harvest trees for wood while ensuring that their actions do not deplete forests, and how plantation management ensures that the amount of timber cut each year does not exceed new tree growth and the rate of replanting.

Decide the details of the design and seek feedback on any final design choices.

ACTIVITY 3

Design a plantation forest

Plantations are forests of trees which are planted to produce wood sustainably. Plantation forestry is like farming. In forestry, trees are the crop being grown to produce wood.

View the George the Farmer forestry video about plantation forests and the different uses for wood sourced from these forests.

Record your thoughts and ideas about how the products that plantation forests give us, provide us with wood to make structural timbers for construction, and wood fibre to make cardboard, paper, tissues and toilet paper!

My records

ACTIVITY 3

Your challenge is to design and produce a plan for a new forested area within the school grounds that includes a wooden "shelter". Might it be a bird hide, cubby house, picnic area or...something else?

Decide on a good area for a 'revegetation project' and create a site plan for the proposed area (1:25 is a good scale to draw your design ideas. This is 4cm:1metre).

Think about what trees need to grow and survive and research the ideal location where good soil and water can be found within the school.

Identify human influences affecting the site (e.g., foot traffic) and plan to minimise these.

Select different plant species that grow at different heights - canopy, shrubs, ground cover and grasses.

Record plant choices on the design and display the design for school community feedback.

Next, design your wooden shelter produced from certified sustainably managed timber. (plantations can be hardwood trees too - and hardwood is much more durable in outdoor uses exposed to sun and rain). What will it look like? Where will you position the shelter?

Calculate the numbers of each type of plant needed and compile a list of materials required to develop the site and wooden shelter. Decide the details of the design and seek feedback on any final design choices. Re-design using the feedback gained from others. Are there any organisations near your school who could help you to source these plants e.g. local council, land for wildlife or landcare?

My design ideas

ACTIVITY 4

101 uses for trees

What is loved about growing trees is producing a renewable and highly versatile product that New Zealanders use every day.

Take a walk and list anything you see that is made from trees.

What I've found

Browse through books and magazines to add to the list.

Sort and classify these into categories.

Food	Shelter	Timber	Medicines	Furniture	Paper	Other

ACTIVITY 4

Prepare a display using labels, photographs, drawings, and examples of products made from trees.

ACTIVITY 4

Use the table below to summarise your learning.

How is the tree used?	Does it satisfy a need or want?	What might be used instead?

ACTIVITY 5

Make paper

Plantations that grow Radiata pine (Pinus Radiata) **forests can be used to make paper.**

Timber is chipped and then cooked with water to make a paste. Chemicals and bleach are then added to the paste for strength. This mixture is known as pulp. The pulp is flattened and the water squeezed out. The flattened paste is dried out and becomes paper. Watch this fun animated clip to find out how paper is made: https://www.youtube.com/watch?v=7IP0Ch1Va44

Make your own paper using water, shredded recycled paper, scissors, spoon, ladle, trays, and screen.

Materials:

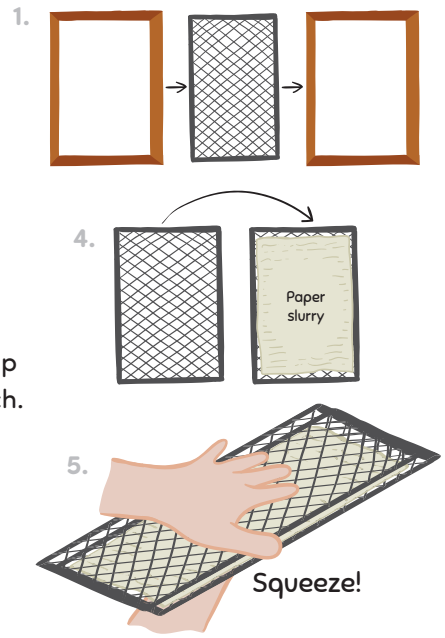
- Water bottle or other container with a tight lid
- 2 picture frames (frame part only), or another type of mold to get desired paper shape
- 2 mesh screens
- Tub or sink to catch water
- Felt or dishcloths
- Rolling pin
- Toilet paper
- Newspaper for drying
- Optional: coloured paper (tissue paper, construction paper, etc., cut or torn into small pieces)
- Optional: glitter, flower petals, flower seeds, other small objects

Part 1

1. Fill water bottle part way with warm water.
2. Add loosely bunched up toilet paper (about 10 squares, depending on size of paper you're making – you may need to experiment with the amount to get the paper the right size).
3. Add any coloured paper or other decorations that you'd like. A little goes a long way!
4. Put the lid on your water bottle and make sure it's on tight.
5. Shake the mixture with all your might for 20 seconds. Look at it – is it all mixed up and mushy?

Good! Does it need more shaking or more water? Shake or add water until your slurry it's ready.

Part 2



1. Make a screen sandwich: 1 picture frame + 1 screen + 1 picture frame

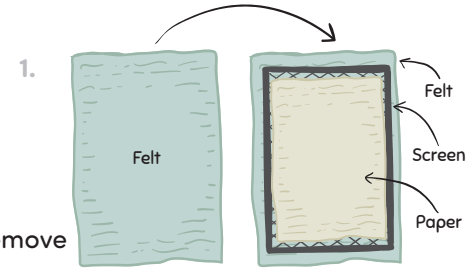
2. Set your screen sandwich over your tub or sink.

3. Pour your paper slurry (mixture) evenly over the screen. If you have holes in your paper, gently fix them. Let the water drip into the tub or sink for a few seconds.

4. Remove the top picture frame and put your 2nd screen on top of your paper slurry so you now have a paper slurry sandwich.

5. Carefully lift up both screens and slurry and press the water out using your flat hands.

Part 3



1. Set your screens and paper slurry on a piece of felt. Cover it with another piece of felt.

2. Use your rolling pin so that the felt absorbs the water from your paper. Be strong!

3. When you think you're done and your paper is dry enough, remove the top piece of felt. Then, remove the top screen. If it doesn't easily come off, your paper is still too wet. Roll it some more.

4. Get your newspaper ready. Open it up so that you can place your paper inside it.

5. Carefully remove your paper from the second screen. You can do this by curling up one edge and slowly lifting it up, or you can try to flip it onto your newspaper. If it's too hard, don't be afraid to dry it off more with the rolling pin and felt. Or, start over and make thicker paper.

6. Let your paper dry for 13 days, until dry.

7. If you want your paper to lay flat, press it under a stack of heavy books, or ask an adult to help you flatten it with an iron.

ACTIVITY 6

Pine plantations

Recall the George the Farmer plantation forestry video and accompanying VR which shows how pine seedlings are propagated in spring and then planted out in winter.

Design a pine plantation propagation and planting calendar for foresters to use.

My designs

ACTIVITY 6

View the video again and recall how baby trees are grown in tubes of rich soil before being transplanted into long beds of soil.

Draw your long beds for planting.

ACTIVITY 6

Did you know that plantations are thinned regularly so that trees can grow faster and bigger.

Draw your version of a machine called the 'feller buncher' that is used to thin the plantation and then draw a 'processor' which removes limbs from the cut trees and then cuts the trunks into lengths.

Draw your version of a feller buncher.

ACTIVITY 6

Design a new piece of machinery that might be used in 2050 to do this type of work in pine plantations. How might it work? How might it be powered with a renewable source of energy?

Share your design ideas with 4 others in the class. Seek their input and then re-design it if necessary.

My designs.

ACTIVITY 7

Design and make a natural paintbrush

There are a whole range of natural items that can be found in a plantation forest, that can be used for making a natural paintbrush. Look around and see what twigs, leaves, shoots, branches, pine needles and grasses you can find.

Think about what might best act as the handle. Then collect different sorts of leaves, shoots, and twigs, thinking about their flexibility and how they might act like a brush.

Brainstorm ideas about how you might connect the brush to the handle.

Now all you need are some natural paints to use. Paints can be made from a variety of natural materials, some of which will be from the earth and others from leaves or vegetables like beetroot or carrots.

Design your natural paintbrush.

ACTIVITY 8

What's your angle?

There are many ways you can measure the height of a tree.

Explore one way you can measure a tree. Watch the video and then have a go!

See https://www.youtube.com/watch?v=F6fltSqlmFM Source: ForestLearning, 2021.

Then, design and make a clinometer and try it yourself. You will need:

- Metal washer or nut
- String
- Drinking straw
- Protractor
- Pen
- Drinking Straw

What to do

Cut a length of string to approximately 20cm.

Tie or tape the string to the middle of the straight edge of the protractor with the round part of the protractor facing downwards. If your protractor is a circle — tie or tape it to the middle. The string should hang straight down towards the 90º mark of the protractor's arch (on some protractors, this might instead be 0º).

Tie the other end of the string to a metal washer or nut to act as a weight.

Cut the drinking straw to fit the length of the straight side of the protractor and tape it into place.

Using a clinometer

Find a tall object, such as a tree or a flagpole.

Walk away from the object until you can easily see the top of it. Make sure you know the distance between you and the base of the object.

Hold the clinometer up with the weight hanging straight down. Angle it until you can see the top of the object through the straw. Make a note of the angle the string crosses through on the edge of the protractor. This number should be between 0 and 90º, where '0' is flat and '90' is straight up.