DISCOVER FORESTRY NEW ZEALAND

Te Haerenga o te Rākau
Discovering Forestry
From Forest to Future

An integrated unit plan for Phase 2

Years 5 and 6 in Aotearoa New Zealand

Big Question

How can people grow and use forests while caring for whenua, wai, living things and communities?

DISCOVER FORESTRY NEW ZEALAND

Purpose and design of the unit

This unit provides a curriculum-aligned foundation from which teachers can create an integrated Years 5–6 unit. It uses forestry as an authentic context for learning in Science, Social Sciences, Mathematics and Statistics, and English. Technology, the Arts, Health and Physical Education, and local curriculum priorities may also be incorporated where teachers add genuine learning value.

The unit is not intended to do all of the thinking for teachers. Teachers are encouraged to strengthen, amend and extend it in response to their learners, local environment, community expertise, available resources and relationships with mana whenua.

Element	Recommendation
Curriculum phase	Phase 2 (Years 4-6), designed specifically for Years 5-6
Duration	Approximately 6 weeks; adaptable to 4-8 weeks
Core learning areas	Science; Social Sciences; Mathematics and Statistics; English
Learning approach	Knowledge-rich, inquiry-informed, practical, local and evidence-based
Culminating task	Design a Forest for the Future
Community connections	Mana whenua, foresters, environmental specialists, engineers, wood processors, transport and port workers

Teacher agency and further learning

· Select the curriculum knowledge that will be explicitly taught; do not attempt to cover every possible connection.

· Use students' questions to identify worthwhile opportunities for further learning.

· Replace generic examples with local forests, waterways, species, industries, histories and community knowledge.

· Invite experts to deepen learning, while retaining teacher responsibility for curriculum design and critical inquiry.

· Allow students to revise conclusions when new evidence or perspectives emerge.

Enduring Understandings

1.Forests contain living and non-living parts that interact.

2.Plants affect soil, water, temperature and habitats.

3.Native ngahere and plantation forests have different histories, characteristics and purposes.

4.People value, manage and use forests in different ways.

5.Forestry decisions can affect people, whenua, waterways and living things.

6.Wood moves through connected systems involving people, places and processes.

7.Measurements, observations and data help people make informed decisions.

8.Good decisions often involve balancing several needs rather than finding one perfect answer.

CURRICULUM ALIGNMENT

DISCOVER FORESTRY NEW ZEALAND

Learning area	Selected Phase 2 direction	Forestry context
Science	Observe living things and environments; investigate relationships and environmental change; explore pushes, pulls, gravity and friction; collect evidence and communicate explanations.	Forest survey; soil, shade and water comparisons; runoff model; biodiversity study; model log-moving investigation.
Social Sciences	Explore relationships among people, places and environments; investigate production, exchange and use of resources; consider values and perspectives; use evidence to make decisions.	Native ngahere and plantation forests; local land-use history; forest-to-product journey; jobs, trade and decision dilemmas.
Mathematics and Statistics	Use appropriate metric measures; estimate and compare; pose investigative questions; collect, represent and interpret data.	Measure trees and environmental conditions; repeat measurements; create tables and graphs; make evidence-based recommendations.
English	Develop subject knowledge and vocabulary; comprehend information texts; identify and connect ideas; discuss, explain, justify, draft, revise and present.	Read authentic texts; interview experts; write explanations and investigation reports; discuss evidence; justify forest-design decisions.

Decide the exact curriculum focus

1. Science knowledge and practices to be explicitly taught?
2. Social Science knowledge and practices to be explicitly taught?
3. Mathematics and Statistics knowledge and practices to be explicitly taught
4. English knowledge and practices to be explicitly taught:

Te Ao Māori woven through the unit

Te Ao Māori should shape how relationships, place, knowledge and responsibility are understood across the unit. It should not be restricted to a glossary, a translation exercise or one isolated lesson on kaitiakitanga.

Concept	Possible contribution to the unit
Whakapapa	Relationships among people, whenua, wai, forests and other living things.
Tūrangawaewae	Connections, belonging and responsibilities associated with particular places.
Kaitiakitanga	Responsibilities expressed through informed, sustained and locally grounded actions.
Mana whenua	Recognition of the authority, histories, priorities and mātauranga of local iwi and hapū.
Taonga species	Why particular species, habitats and relationships carry significance.
Intergenerational thinking	How decisions made today may affect mokopuna and future environments.

Local iwi / hapū relationships and contacts:

Local places, names, histories or pūrākau that may appropriately inform learning:

How local knowledge holders will be acknowledged and involved:

Knowledge students need

Native ngahere and plantation forests

Native ngahere	Plantation forest
Contains predominantly indigenous species and often many habitat layers.	Is deliberately established and managed for particular purposes.
Carries ecological, whakapapa, cultural, customary and recreational significance.	Often contains one main commercial tree species and produces renewable wood.
May be protected, restored or used according to particular rights and responsibilities.	Is planted, tended, harvested and usually replanted as part of a managed cycle.
Provides habitat for diverse indigenous organisms.	Can also contain native remnants, waterways and habitat that require protection.

Inquiry questions

- **What makes a forest a system?**
- **How are native ngahere and plantation forests similar and different?**
- **How have people and forests shaped our local area over time?**
- **What happens to soil, water and living things when vegetation changes?**
- **How can people move heavy wood safely?**
- **How does a tree become a useful product?**
- **Who makes decisions about forests, and whose knowledge and values matter?**
- **How can a forest provide wood while also caring for people, whenua, wai and living things?**

DISCOVER FORESTRY NEW ZEALAND

Questions ākonga may investigate further

- **What birds and animals live in and around a plantation forest?**
- **What happens after harvesting?**
- **How do foresters protect waterways and reduce erosion?**
- **Where does the carbon in a wooden desk come from?**
- **What forestry and wood-processing work happens in our region?**
- **What should happen if threatened wildlife is found in an operational forest?**

Suggested six-week learning sequence

Week	Big investigation	Core learning and experiences	Evidence of learning
1	What makes a forest a system?	Living/non-living components; habitats; leaf litter; food relationships; initial forest or school-ground observation.	Annotated system diagram; oral explanation; observation notes.
2	Forests, people and whenua	Native ngahere and plantation forests; local histories; uses and values; whakapapa, tūrangawaewae and kaitiakitanga.	Comparison; local evidence map; reflective explanation.
3	What happens when forests change?	Vegetation, soil, water, erosion, harvesting, replanting and habitat protection; runoff investigation.	Investigation record; data display; evidence-based explanation.
4	How can we move a log safely?	Pushes, pulls, gravity, friction, slope and model cable systems; design-test-improve challenge.	Labeled design; test results; explanation of improvement.
5	Where does wood go?	Nursery-to-product pathway; people and jobs; processing; local use and export; simple carbon pathway.	Supply-chain map; role explanation; information text.
6	What should a future forest look like?	Tree data; realistic decision dilemmas; synthesis and final forest design.	Final design, presentation and justification.

CULMINATING RICH TASK

DESIGN A FOREST FOR THE FUTURE

DISCOVER FORESTRY NEW ZEALAND

STUDENT CHALLENGE

A landowner wants to grow useful wood, but the land also contains a stream, native habitat and places important to the local community. Design a forest plan that cares for people, whenua, wai and living things.

The design could show

- production trees and the planned growing/harvesting cycle
- native vegetation and protected habitat
- a stream, wetland or other water feature with riparian protection
- access routes, forestry roads and safe operational areas
- water, erosion and sediment management
- fire prevention or response features
- community, cultural or recreational areas
- how harvested areas will be replanted or restored
- how wood will move from the forest into useful products

Students explain

1. what they included and why
2. which observations, measurements, texts or expert evidence informed the design
3. how the design cares for soil, water and living things
4. how people obtain useful wood from the forest
5. whose knowledge, rights, responsibilities and perspectives should be considered
6. one compromise or trade-off and how it was managed

Possible evidence

Annotated map • physical model • digital design • poster • oral presentation • recorded explanation • written report

Assessment Dimensions

Dimension	Evidence to look for
Scientific understanding	Explains relevant relationships among vegetation, soil, water, habitats and environmental change.
Social understanding	Recognises that people use and value forests differently and that decisions affect people and places.
Mathematical/statistical reasoning	Uses suitable measurement or data accurately and interprets it appropriately.
Communication	Organises and communicates ideas clearly using relevant vocabulary, evidence and explanation.
Decision-making	Justifies choices, considers more than one perspective and recognises a genuine trade-off.

Assessment and evidence plan

Diagnostic evidence

- Initial forest-system drawing or concept map
- Predictions about native ngahere and plantation forests
- Student questions and existing vocabulary
- Initial response to a simple forestry dilemma

Formative evidence

- Notes, observations and diagrams
- Investigation planning and data records
- Oral explanations and peer questioning
- Revised models following new evidence
- Supply-chain sequence and role explanations
- Design-test-improve records from the engineering challenge

Summative evidence

- Design a Forest for the Future product
- Written, oral or recorded justification
- Student self-assessment against shared criteria
- Response to questions about evidence, consequences and trade-offs

Lesson 1: A Forest Is a Living System

Learning areas: Science, English, Social Sciences

Suggested duration: 60–75 minutes

Key concepts: ngahere, relationships, habitat, soil, water, vegetation, change

Learning intention
We are learning how plants, animals, soil, water, sunlight and people are connected within a forest system.

Success criteria
Students can:
identify living and non-living parts of a forest;
describe at least three relationships within a forest system;
use observations from a model as evidence;
explain how vegetation can affect water movement and soil erosion.

Essential knowledge
Explicitly teach that:

- **a forest contains living and non-living components;**
- **living things depend on one another and their physical environment;**
- **tree roots help hold soil in place;**
- **leaves, branches and ground vegetation intercept and slow rainfall;**
- **water moving quickly over exposed soil can carry sediment;**
- **both native ngahere and plantation forests contain interacting living and non-living components;**
- **plantation forests are managed environments, but they can still contain waterways, native remnants and habitats.**

Vocabulary
ngahere, rākau, organism, habitat, vegetation, soil, runoff, erosion, sediment, infiltration, canopy, relationship

Resources

- **contrasting images of native ngahere, plantation forest, harvested land and replanted forest;**
- **two shallow trays;**
- **soil;**
- **grass, moss, small plants, leaf litter or other vegetation;**
- **watering bottle or jug;**
- **books or blocks to create equal slopes;**
- **collection containers;**
- **observation sheet;**
- **optional measuring cups.**

Learning sequence

1. Engage: What belongs in a forest?

Display contrasting images of forests.

Ask students to identify:

- **living things;**
- **things that were once living;**
- **non-living components;**
- **signs of water;**
- **signs of people;**
- **possible relationships they cannot immediately see.**

Introduce the question:

What might change if some of the vegetation is removed?

Record students' predictions without judging them yet.

2. Explicit teaching: A forest is a system

Construct a class forest-system diagram.

Possible connections include:

- **sunlight helps plants grow;**
- **plants provide food and habitats;**
- **roots interact with and help stabilise soil;**
- **leaf litter provides habitat and contributes organic material;**
- **water supports living things;**
- **insects may pollinate plants or provide food for birds;**
- **people use, manage, protect and change forests.**

Explain that changing one part of a system can affect other parts.

3. Investigation: Rain on the forest

Set up two trays at the same slope:

- **Tray A: soil covered with vegetation and leaf litter;**
- **Tray B: mostly exposed soil.**

Pour the same volume of water onto each tray from the same height and for the same amount of time.

Students observe:

- **how quickly water moves;**
- **the amount of runoff;**
- **the colour of the collected water;**
- **how much soil has moved;**
- **where water pools or infiltrates.**

If appropriate, students measure and compare the collected runoff.

FOREST SYSTEMS MODEL

A simple hands-on model to explore gradient, erosion and water.

1. SET UP YOUR MODEL

You will need:

- An old tray or paint tray
- Different soils and clay
- Leaves, small branches, twigs, rocks
- A water bottle with holes in the lid or a small watering can



2. MAKE PREDICTIONS

What do you think will happen when it rains?
Where will the water go?
Which soil will erode more?
How do the leaves and branches help?

3. ADD RAIN

Use your water bottle with holes in the lid or a watering can to sprinkle water like rain over the top of the slope. Watch what happens!



4. OBSERVE AND DISCUSS

- Where did the water flow the fastest?
- Which soil lost the most? (Erosion)
- Where did the water collect?
- How did the leaves and branches affect the erosion?
- How does gradient (slope) affect the movement of water?

LEARNING IDEA:

Forests protect soil from erosion, slow down water and help keep our waterways clean.

Interpret the evidence
Students complete:

Observation	What might this mean?
The water from one tray was muddier	More sediment may have been carried from the soil
Water moved more slowly through vegetation	Vegetation may slow runoff
Less soil moved from one tray	Roots and ground cover may help protect soil

Apply to forestry

Ask:
What might foresters do to protect soil and water when trees are harvested?

Possible responses include:

protect stream margins;
retain or establish vegetation beside waterways;
plan roads and drainage carefully;
avoid work during unsafe wet conditions;
replant harvested areas;
monitor erosion and sediment;
protect areas with particularly high erosion risk.

Reflection
Students complete:
Vegetation can affect soil and water by...
My evidence is...
One question I still have is...

Opportunity for further learning
Investigate leaf litter, soil organisms, infiltration, riparian planting or the species living within local plantation forests.

Lesson 2: How Can We Move a Log Safely?

Learning areas: Science, Mathematics and Statistics, Technology

Suggested duration: 75–90 minutes

Key concepts: pushes, pulls, gravity, friction, slope, design, safety

Learning intention
We are learning how pushes, pulls, gravity, friction and slope affect the movement of an object.

Success criteria
Students can:

- **identify forces acting on a model log;**
- **explain how slope and surface affect movement;**
- **design and test a system for moving a model log;**
- **use evidence from testing to improve their design;**
- **explain how their system manages safety.**

Essential knowledge

Explicitly teach that:

- **a force is a push or a pull;**
- **gravity pulls objects towards Earth;**
- **friction opposes movement between surfaces;**
- **steeper slopes can increase the effect of gravity on an object's movement;**
- **rollers, ramps and pulleys can change how an object is moved;**
- **moving heavy logs on steep land requires careful engineering and safety systems.**

Vocabulary
force, push, pull, gravity, friction, surface, slope, load, pulley, roller, ramp, tension, design, test, improve

Resources

- **wooden cylinders, dowels or objects representing logs;**
- **string;**
- **cardboard;**
- **ramps;**
- **blocks;**
- **rollers or pencils;**
- **simple pulleys;**
- **masking tape;**
- **rough and smooth surface materials;**
- **spring scales, if available;**
- **recording sheets.**

Learning sequence

1. Engage: Why not just carry the logs?
Show an image or short video of logs being moved on steep land.

Ask:

- **Why would carrying or dragging logs by hand be unsafe?**
- **What is pulling the logs downhill?**
- **What could make a log easier or harder to move?**
- **How might machinery help?**

Introduce the challenge:
Move a model log from the "forest" to the "landing" without touching the log directly with your hands.Explicit teaching and investigation stations

Students rotate through three short stations.
Station A: Slope and gravity
Release the same object on ramps of different steepness. Observe how the slope changes its movement.

Station B: Friction
Pull the same object across smooth, rough and textured surfaces. Compare the effort required.

Station C: Changing the movement
Experiment with rollers, string and a pulley. Discuss how each system changes the way the force is applied.

Students record:

- **what they changed;**
- **what they observed;**
- **which force was important;**
- **what this might mean for their final design.**

Design challenge
In teams, students plan a model system that will:

- **move the log to a marked landing;**
- **keep the log within the designated route;**
- **avoid people standing below the load;**
- **use only the provided materials;**
- **complete the movement safely and reliably.**

Students draw and label their design before building it.

Test and improve
Teams test their systems.
After the first test, they record:

- **what worked;**
- **what did not work;**
- **where friction helped or hindered movement;**
- **how gravity affected the load;**
- **one safety concern;**
- **one improvement.**

They then modify and retest the design.

Share explanations
Each team explains:
Our system uses a pull to…
Gravity affects our log by…
Friction was helpful/harmful because…
We improved safety by…

Assessment evidence
Look for accurate explanations of the forces involved and evidence-based improvements—not merely whether the model moved quickly.

Opportunity for further learning
Compare cable extraction, ground-based machinery and other methods used to move logs. Invite a harvesting or engineering specialist to explain why different terrain requires different systems.



Te Haerenga o te Rākau

FORCES IN FORESTRY

Pushes, Pulls and Moving Logs — Years 5–6

Name: _____

Date: _____

Group: _____

LEARNING FOCUS How do pushes, pulls, gravity, friction and slope affect the way a log moves?



PART 1: TEST AND OBSERVE

Rotate through each station. Test, observe and record what happens.

1 GRAVITY AND SLOPE



What did you change?

☐ ramp height ☐ ramp angle ☐ surface

What I observed		What happened?
Movement		
Speed		
Control		

What did you notice when the slope became steeper?

_____

_____

2 FRICTION

Test three different surfaces.



Surface	Easy or hard to move?	What did you notice?
1		
2		
3		

Which surface made the log easiest to move?

_____

How did friction change the movement?

_____

_____

3 PULLING WITH A PULLEY

How many pulleys did you use? _____

What I observed	What happened?
Pull needed	
Movement	
Control	
Safety	

How did the pulley help you move or control the log?

_____

_____

PART 2: COMPARE AND THINK

Which test made the log easiest to move? Why? _____

_____

Which test gave you the most control? Why? _____

_____

Which method seemed safest? Why? _____

PART 3: DESIGN CHALLENGE — MOVE THE LOG

TASK: Design a system that moves a model log uphill to the landing without touching the log with your hands.

MY DESIGN SKETCH

Draw your system. Label the ramp, rope, pulley or rollers you use.

MY DESIGN PLAN

What materials will you use?

_____

_____

How will your system move the log?

_____

_____

How will you keep people and the load safe?

_____

_____

PART 4: TEST AND IMPROVE

Test	What worked?	What will we change?
1		
2		
3		

PART 5: REFLECT

One force that affected our log was... _____

Our evidence was... _____

_____

We improved our design by... _____

_____

OPTIONAL CHALLENGE

How could you change your design for:

- a steeper slope? _____
- a rougher surface? _____
- a heavier log? _____

THINK LIKE A FORESTER

DESIGN • TEST • OBSERVE • IMPROVE

Lesson 3: Follow the Log

Learning areas: Social Sciences, English, Science

Suggested duration: 60–75 minutes

Key concepts: production, processing, transport, trade, work, connection

Learning intention

We are learning how a tree becomes a useful wood product and how people and places are connected through this journey.

Success criteria

Students can:
sequence the main stages from growing a tree to using a wood product;
describe the contribution of different workers;
distinguish between local processing and export pathways;
explain how a change at one stage could affect other parts of the system.

Essential knowledge

Explicitly teach that:
plantation forests are established and managed to produce renewable wood;
trees are planted, tended, measured, harvested and replanted;
logs may be processed in Aotearoa New Zealand or exported;
processing can turn logs into timber, pulp, paper, panels and other products;
transport and communication connect forests, mills, ports, manufacturers and users;
wood products can continue storing some of the carbon incorporated while the tree was growing;
every stage involves people with specialised knowledge and responsibilities.

Vocabulary

nursery, seedling, plantation, silviculture, harvest, log, transport, sawmill, process, timber, product, customer, export, supply chain, renewable

Resources

- stage and role cards;
- string or wool;
- map of Aotearoa New Zealand and a world map;
- samples or images of wood products;
- large paper;
- optional local forestry and processing information.

Learning sequence

1. Engage: Where did this come from?
Display everyday objects such as:
a pencil;
paper;
cardboard;
a wooden chair;
a building frame;
tissue;
a wooden toy.
Ask:
What journey did the material make before it became this product?

Explicit teaching: From tree to product
Introduce and sequence the main stages:

1. seeds and nursery;
2. planting;
3. forest management;
4. measurement and planning;
5. harvesting;
6. transport;
7. processing or export;
8. manufacturing;
9. use;
10. reuse, recycling or end of life;
11. replanting and the next forest cycle.

Clarify that not every log follows exactly the same pathway

Human supply chain
Give students roles such as:

- nursery worker;
- forester;
- environmental specialist;
- machine operator;
- logging truck driver;
- sawmill worker;
- port worker;
- builder;
- furniture maker;
- customer.

Students stand in sequence and use string to show the connections among their roles.
Ask each student:
What do you need from the person before you?
What do you provide to the next person?
What knowledge or responsibility does your role require?

4. Local and export pathways

On a map, create two possible journeys:
Local pathway
Forest → truck → New Zealand mill → timber → local builder → home
Export pathway
Forest → truck → port → ship → overseas processor → product
Students compare what remains the same and what changes.
Avoid turning this into detailed market or price analysis. The key learning is that production and trade connect people and places.

5. Introduce the carbon journey
Create a second, simpler sequence:
Carbon dioxide in the atmosphere → growing tree → log → timber → wooden product
Explain that this is only one part of the wider carbon story, but it shows where some of the material in wood originated.

6. Apply a disruption
Give each group one scenario:

- heavy rain closes a forest road;
- a machine at the mill breaks down;
- the port cannot load a ship;
- a habitat area must be protected;
- a customer changes an order.

Students identify who else may be affected.

7. Reflection

Students create an annotated Follow the Log diagram and explain one connection between two people or places.

Assessment evidence
Look for accurate sequencing and explanations of interdependence, rather than memorisation of job titles.

Opportunity for further learning
Follow a locally produced wood product, visit a sawmill or interview someone involved in harvesting, transport, processing, construction or furniture making

CARBON STORED,

New Zealand | Aotearoa Style

Forests naturally capture carbon and store it – in trees, in wood, in our homes and for generations to come.



1 ATMOSPHERE

Carbon dioxide (CO_2) in the air surrounds us.

2 TREE

Trees absorb CO_2 through photosynthesis and store the carbon as they grow.

3 WOOD

Harvested timber locks carbon in the wood.

4 HOUSE

Wood is used to build strong, beautiful homes that can last for decades.

5 CARBON STORED

Carbon stays locked away – in the wood, in the home and out of the atmosphere.

GOOD FOR OUR CLIMATE.
GOOD FOR NEW ZEALAND | AOTEAROA.

Growing forests. Stronger futures.

Nature. Innovation. Responsibility.

Lesson 4: The Forestry Decision Challenge

Learning areas: Social Sciences, English, Science

Suggested duration: 75–90 minutes
Key concepts: evidence, perspective, consequence, responsibility, trade-off

Learning intention
We are learning how people use evidence and consider different perspectives when making forestry decisions.

Success criteria
Students can:

- identify the people and environments affected by a decision;
- distinguish evidence from opinion;
- consider environmental, safety, cultural, community and practical consequences;
- justify a decision using evidence;
- recognise that a responsible decision may still involve a compromise.

Essential knowledge
Explicitly teach that:

- forestry decisions affect interconnected people, places and environments;
- different people may have different knowledge, responsibilities and priorities;
- safety and legal restrictions can limit possible actions;
- environmental protection, cultural values, employment, access, timing and cost may all matter;
- kaitiakitanga involves responsibilities and sustained actions, not simply “looking after nature”;
- reliable decisions require evidence and appropriate consultation.

Vocabulary
evidence, perspective, responsibility, consequence, safety, community, cultural, environmental, economic, risk, option, compromise, trade-off, recommendation

Resources

- role cards;
- scenario cards;
- decision-recording sheet;
- evidence cards;
- large decision matrix.

Learning sequence

1. Engage: Can everyone get everything they want?

Present a simple dilemma:
A plantation block is ready for harvest. A stream runs through the block, heavy rain is forecast, workers are scheduled, and native fish live downstream. What should happen?
Ask students for immediate responses. Explain that they will revisit their initial decisions after examining evidence.

2. Introduce the decision lenses
Students consider five lenses:

- Environment: What might happen to soil, water and living things?
- Safety: Could workers, road users or the public be harmed?
- People and community: Who depends on the forest or uses the area?
- Culture and place: Whose rights, relationships, knowledge and values must be considered?
- Practical needs: What time, equipment, money and coordination are required?

Clarify that a cultural perspective should not be invented. In a real situation, appropriate mana whenua engagement would be necessary.
Assign accessible roles
Possible roles include:

- forest manager;
- environmental specialist;
- worker or contractor;
- resident neighbour
- mana whenua representative;
- transport coordinator;
- recreational user.

The mana whenua role card should not contain invented tikanga. It can state:
Your role is to ensure mana whenua are appropriately involved and that known cultural sites, waterways and relationships with whenua are respected. Identify what additional information or consultation is required.

Examine the evidence
Provide evidence such as:

- rainfall forecast;
- road-condition report;
- stream map;
- habitat information;
- worker schedule;
- erosion-risk map;
- information about harvesting and replanting;
- community access information.

Students sort statements into:

- evidence;
- opinion;
- missing information;
- question requiring consultation.

5. Decision matrix
Groups evaluate options such as:
Option A: Continue harvesting and transport as planned.
Option B: Continue limited work but stop truck movements.
Option C: Pause operations until conditions improve.
Option D: Propose another evidence-based response.
They record potential benefits, risks and affected groups.

6. Make and present a recommendation
Groups present:
We recommend…
The strongest evidence is…
This protects or supports…
One disadvantage or compromise is…
Before acting, we would still need to find out…

7. Reconsider the initial response
Students compare their final recommendation with their initial opinion.

Assessment evidence
Look for:

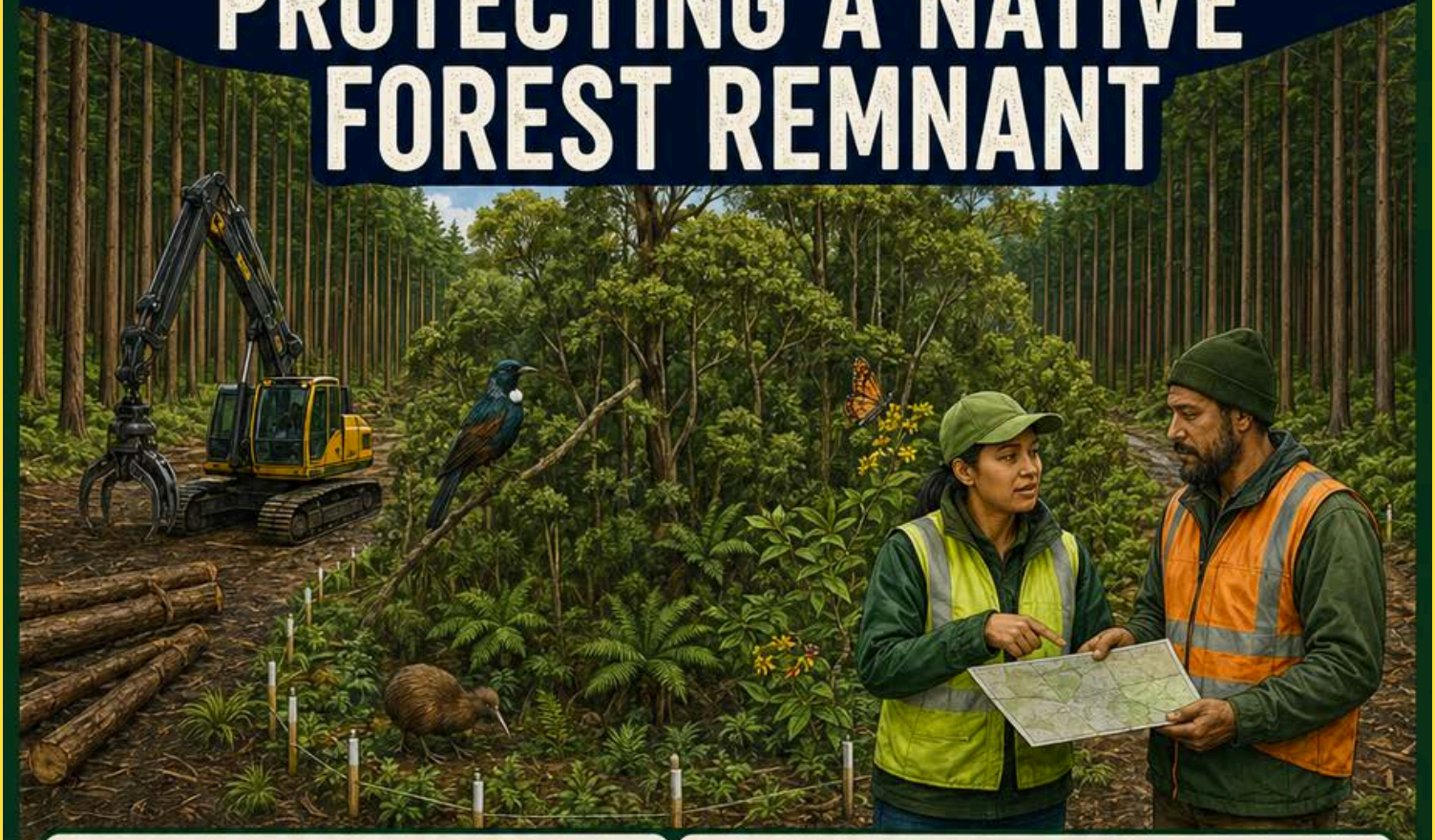
- use of evidence;
- acknowledgement of missing information;
- consideration of more than one perspective;
- recognition of consequences and compromises.
-

Opportunity for further learning

Use further scenarios involving fire danger, erosion-prone land, kiwi detection, road access, harvesting near a waterway or protection of a culturally significant place.

SCENARIO CARD 8

PROTECTING A NATIVE FOREST REMNANT



THE SITUATION

A small area of native vegetation lies within a plantation forest. It provides habitat for birds, insects and other living things.

Trees surrounding it are ready for harvest.

WHAT YOU KNOW

- The native remnant has ecological value.
- It may also have cultural or historical significance.
- Harvesting machinery needs enough space to work safely.
- Falling trees could damage the protected vegetation.
- Increasing the distance between harvesting and the remnant would leave some plantation trees unharvested.

YOUR CHALLENGE

How should the area be managed during harvesting?

POSSIBLE OPTIONS

A. Harvest up to the edge of the native vegetation.
B. Create a protective buffer around the remnant.
C. Harvest only selected surrounding trees.
D. Develop another evidence-based response.

WHAT ELSE DO YOU NEED TO KNOW?

Consider the species present, the shape and size of the remnant, safe tree-felling distances, mana whenua knowledge and opportunities to strengthen the habitat.

THINK LIKE A FORESTER

USE EVIDENCE • CONSIDER PERSPECTIVES • EXPLAIN YOUR DECISION

SCENARIO CARD 9

PROTECTING ARCHAEOLOGICAL TAONGA



THE SITUATION

While planning a new forestry road, workers notice raised earthworks and hollows that may be part of a pā site and kūmara storage pits. The area may contain archaeological taonga.

YOUR CHALLENGE

How should the forestry team protect the site and plan the work?

WHAT YOU KNOW

- Pā sites and kūmara pits hold important evidence of Māori history and relationships with whenua.
- Disturbing the ground could damage information and taonga that cannot be replaced.
- Mana whenua hold knowledge, rights and responsibilities connected with the site.
- Exact locations and information may be sensitive and should not be shared without permission.
- Archaeologists and heritage authorities may need to be involved.

POSSIBLE OPTIONS

A. Stop work in the area and establish a temporary protection zone.

B. Work with mana whenua and archaeological experts before making a new plan.

C. Change the road or harvesting plan to avoid the site.

D. Develop another response that protects the site and follows expert guidance.

WHAT ELSE DO YOU NEED TO KNOW?

Consider the boundaries and condition of the site, mana whenua guidance, archaeological advice, legal requirements and whether the road or work area can be relocated.

THINK LIKE A FORESTER

USE EVIDENCE • CONSIDER PERSPECTIVES • EXPLAIN YOUR DECISION

SCENARIO CARD 1

HEAVY RAIN IS COMING



THE SITUATION

A plantation block is ready for harvest. A stream runs through the block, and native fish live downstream. Workers and logging trucks are scheduled for tomorrow, but heavy rain is forecast overnight.

WHAT YOU KNOW

- Heavy rain can make forest roads slippery.
- Water flowing across exposed soil can carry sediment into streams.
- Workers and equipment have already been scheduled.
- Delaying work could affect other parts of the supply chain.
- Protecting workers and waterways is important.

YOUR CHALLENGE

What should happen tomorrow?

POSSIBLE OPTIONS

A. Continue all work as planned.

B. Continue limited work but stop truck movements.

C. Pause work until conditions improve.

D. Develop another evidence-based response.

WHAT ELSE DO YOU NEED TO KNOW?

Consider the amount of rain expected, road conditions, slope, soil, drainage, stream protection and alternative work available.

THINK LIKE A FORESTER

USE EVIDENCE • CONSIDER PERSPECTIVES • EXPLAIN YOUR DECISION

SCENARIO CARD 2

KIWI HAVE BEEN DETECTED



THE SITUATION

A monitoring team has detected kiwi in part of a plantation forest. Trees in the area are scheduled to be harvested soon.

WHAT YOU KNOW

- Kiwi are a taonga species.
- Forestry workers must avoid harming protected wildlife.
- Kiwi can move between native vegetation and plantation forests.
- Harvesting has already been planned.
- Local experts and mana whenua may hold important knowledge about the area.

YOUR CHALLENGE

How should the forestry team respond?

POSSIBLE OPTIONS

A. Continue harvesting because the exact location of the kiwi is uncertain.

B. Establish a temporary protection area and continue work elsewhere.

C. Pause all work until more information is collected.

D. Develop another evidence-based response.

WHAT ELSE DO YOU NEED TO KNOW?

Consider where the kiwi were detected, whether they are nesting, what specialist advice is available and which areas could be worked safely.

THINK LIKE A FORESTER

USE EVIDENCE • CONSIDER PERSPECTIVES • EXPLAIN YOUR DECISION

SCENARIO CARD 5

EXTREME FIRE DANGER



THE SITUATION

The weather has been hot, dry and windy. The fire-danger level in the forest is extremely high, but several forestry crews are scheduled to work.

WHAT YOU KNOW

- Machinery and vehicles can sometimes create heat or sparks.
- Wind can cause a fire to spread rapidly.
- Workers need income and businesses need to meet commitments.
- A forest fire could endanger workers, neighbouring communities, wildlife and the forest.
- Some work may present less fire risk than other work.

YOUR CHALLENGE

What work, if any, should continue?

POSSIBLE OPTIONS

A. Continue all work but carry additional firefighting equipment.

B. Allow only selected low-risk activities.

C. Close the forest until the fire danger decreases.

D. Develop another evidence-based response.

WHAT ELSE DO YOU NEED TO KNOW?

Consider wind speed, temperature, fire restrictions, escape routes, nearby communities, available equipment and expert fire advice.

THINK LIKE A FORESTER

USE EVIDENCE • CONSIDER PERSPECTIVES • EXPLAIN YOUR DECISION

SCENARIO CARD 7

WOOD LEFT ON A STEEP SLOPE



THE SITUATION

Some usable logs remain on a steep slope after harvesting. Recovering them could provide more wood, but additional work may disturb the slope and expose workers to risk.

WHAT YOU KNOW

- The remaining wood has economic value.
- Working on steep land can be hazardous.
- Additional machinery may disturb soil.
- Leaving large amounts of wood in the wrong place may also create risks.
- A different recovery method may be safer but cost more.

YOUR CHALLENGE

What should happen to the remaining wood?

POSSIBLE OPTIONS

A. Recover as much wood as possible using the existing machinery.

B. Recover only the wood that can be reached safely.

C. Use a different harvesting or extraction method.

D. Leave some wood in carefully selected locations.

WHAT ELSE DO YOU NEED TO KNOW?

Consider slope stability, worker safety, weather, waterways, the location of the wood and specialist advice.

THINK LIKE A FORESTER

USE EVIDENCE • CONSIDER PERSPECTIVES • EXPLAIN YOUR DECISION

SCENARIO CARD 4

A STREAM CROSSING IS NEEDED



THE SITUATION

Forestry workers need to reach a new part of the forest. The shortest route requires vehicles to cross a stream.

WHAT YOU KNOW

- Native fish and freshwater insects live in the stream.
- Vehicles cannot simply drive through the water.
- A longer route would require more travel and fuel.
- Poorly designed crossings can obstruct fish movement or release sediment.
- Engineers and environmental specialists can design different crossing systems.

YOUR CHALLENGE

How should access to the forest be provided?

POSSIBLE OPTIONS

A. Build a permanent bridge or carefully designed crossing.
B. Use a temporary crossing during forestry work.
C. Construct a longer route that avoids the stream.
D. Develop another evidence-based solution.

WHAT ELSE DO YOU NEED TO KNOW?

Consider water flow, flood risk, fish passage, construction materials, length of use and the significance of the waterway to mana whenua.

THINK LIKE A FORESTER

USE EVIDENCE • CONSIDER PERSPECTIVES • EXPLAIN YOUR DECISION

Lesson 5: What Can Our Trees Tell Us?

Learning areas: Mathematics and Statistics, Science, English

Suggested duration: Two sessions of 60–75 minutes

Key concepts: statistical question, data, measurement, variation, evidence

Learning intention
We are learning how to collect and use data to answer a question about trees or their environment.

Success criteria
Students can:
pose a manageable investigative question;
decide what data are needed;
collect and record data consistently;
represent data appropriately;
describe a pattern or difference;
make a cautious conclusion supported by evidence.

Essential knowledge
Explicitly teach that:

- a statistical investigative question expects variation in the data;
- measurements need a clearly agreed method and suitable units;
- data should be recorded systematically;
- tables and graphs help reveal patterns and differences;
- a conclusion should answer the original question;
- a small or limited dataset does not justify a sweeping claim.

Possible investigative questions

- What are the circumferences of trees in different parts of our school?
- Is the temperature different under trees and in open areas?
- Which tree species are most common in our school grounds?
- Do larger trees have wider canopies?
- Where do we observe the greatest number of different organisms?
- Is soil moisture different under vegetation and on exposed ground?

Choose one class question or allow groups to select from a controlled range.

Vocabulary
statistical question, variable, category, data, estimate, measure, unit, circumference, canopy, frequency, table, graph, scale, pattern, variation, conclusion, limitation

Resources
measuring tapes;
metre rulers;
thermometers, if available;
tree-identification information;
clipboards;
recording sheets;
graph paper or digital graphing tool;
chalk or cones for marking measurement positions.

Learning sequence
Session one: Plan and collect
1. Begin with a question
Compare:
How tall is this tree?
with:
What are the heights of trees in our school grounds?
Discuss why the second question expects a range of answers.

2. Plan the investigation
Students identify:

- the question;
- what will be measured or counted;
- the unit or categories;
- which trees or sites will be included;
- how measurements will be taken consistently;
- how results will be recorded.

3. Model the method
For circumference:

- measure around the trunk;
- use the same agreed height from the ground;
- keep the tape level;
- record in centimetres;
- repeat if the result seems unusual.

For temperature:

- use the same type of thermometer;
- measure at a consistent height;
- allow the same waiting time;
- avoid holding the thermometer bulb;
- record whether the site is shaded or open.

4. Collect data
Students work in supervised teams. Each person has a clear role:
measurer;
recorder;
equipment manager;
method checker.

5. Check the data
Groups identify missing, impossible or questionable values and repeat measurements where appropriate.

Session two: Represent and interpret
6. Organise the results
Students create an appropriate:

- frequency table;
- bar graph;
- dot plot;
- simple comparative display;
- annotated map.

The representation should match the type of data collected.
7. Notice and interpret
Use the structure:
I notice…
The evidence is…
This might mean…
We cannot conclude that… because…
8. Write a cautious conclusion
Example:
In the places we measured, the shaded sites were generally cooler than the open sites. However, we measured only six sites on one morning, so we cannot assume this will always be true.

Assessment evidence
Assess the coherence of the investigation:
question → method → data → display → conclusion
A colourful graph is not sufficient if it does not answer the question accurately.

Opportunity for further learning

Compare results at different times, seasons or sites, or share the data with a forester or environmental specialist and ask what additional information they would collect.

Lesson 6: Measuring Trees Carefully

Learning areas: Mathematics and Statistics, Science, English

Suggested duration: 60–75 minutes

Key concepts: measurement, estimation, units, accuracy, variation, method

Learning intention

We are learning to select appropriate measurements, use tools consistently and explain why repeated measurements can differ.

Success criteria

Students can:
estimate before measuring;
choose an appropriate tool and unit;
measure length, circumference or diameter carefully; foresters measure diameter at chest height. DBH Tapes are used.
repeat and compare measurements;
identify possible sources of variation;
explain why careful measurement matters in forestry.

Essential knowledge

Explicitly teach that:

- different attributes require different measurements;
- length and circumference are not the same;
- diameter is the distance across a circular object through its centre;
- appropriate metric units should be selected;
- estimates provide a useful reasonableness check;
- measurements can vary because of tool placement, reading, rounding, uneven objects or different methods;
- people need agreed methods if results are to be compared;
- foresters measure trees to support planning and decision-making.

Cylinder-volume calculations are not required in this lesson.

Vocabulary

attribute, estimate, measure, unit, millimetre, centimetre, metre, circumference, diameter, temperature, repeat, compare, accuracy, variation, method

Resources

- flexible measuring tapes;
- rulers and metre rulers;
- string;
- model logs or cylindrical classroom objects;
- selected trees;
- thermometers or stopwatches, if used;
- recording sheet.

Learning sequence

1. Engage: Same tree, different answers
Present two different reported measurements for the same tree trunk.
For example:
Group A: 86 cm
Group B: 93 cm

Ask:
Could both groups have used the tape correctly?
What might have caused the difference?
What information do we need before deciding?
Likely causes include measuring at different heights, a sloping tape, incorrect reading, rounding or recording errors.

2. Explicitly teach the attributes
Demonstrate:
length: distance from one end to another;
circumference: distance around an object;
diameter: distance across the centre; Use a DBH tape if possible
temperature: how hot or cold something is;
time: duration of an event.

Ask students to match each attribute with a suitable tool and unit.

3. Estimate first
Students estimate the:
circumference of a tree;
length of a model log;
diameter of a circular object;
distance between two marked points.
They record estimates before measuring.

4. Agree on a measurement protocol
The class establishes rules such as:
measure trunk circumference at an agreed height;
keep the tape level;
do not twist the tape;
use centimetres;
read at eye level;
record immediately;
repeat the measurement.

5. Measure, repeat and compare
Pairs measure the same objects independently and compare results.

Opportunity for further learning
A forester could demonstrate a diameter tape, tree-height instrument or sample-plot process and compare professional methods with the students' classroom methods.

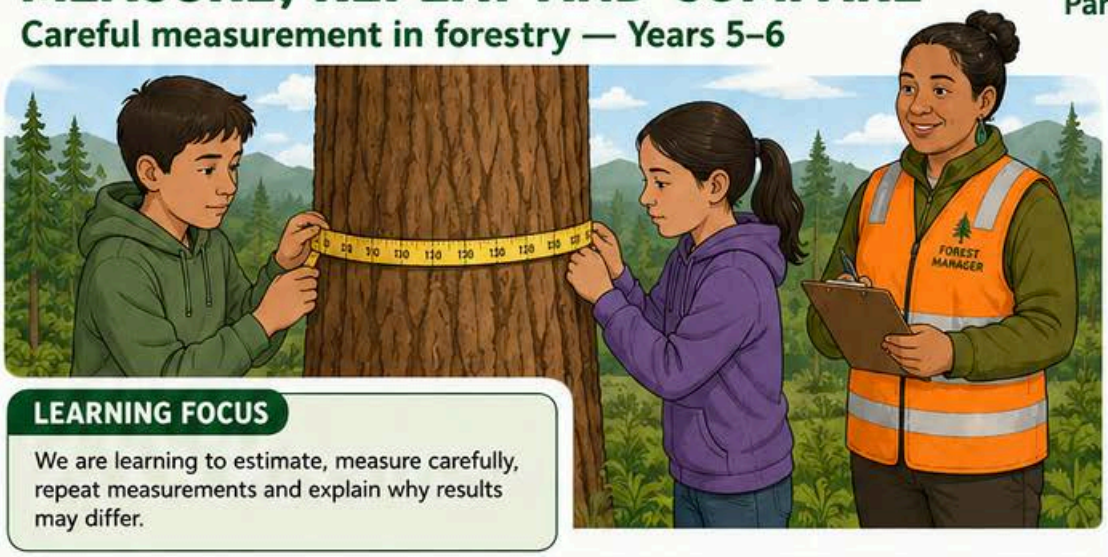
TE HAERENGA O TE RĀKAU
MEASURE, REPEAT AND COMPARE

Careful measurement in forestry — Years 5–6

Name: _____

Date: _____

Partner: _____



Tree trunk cross-section



Flexible tape measure



Growth record



Year	Age	Circumference
2021	10	95
2022	11	102
2023	12	110
2024	13	118
2025	14	127

LEARNING FOCUS

We are learning to estimate, measure carefully, repeat measurements and explain why results may differ.

PART 1: ESTIMATE AND MEASURE

Work independently. Estimate first. Then both partners measure the same object using the same agreed method.

OBJECT	ATTRIBUTE	ESTIMATE	FIRST MEASUREMENT	SECOND MEASUREMENT	DIFFERENCE

Possible attributes: length • circumference • diameter • distance

PART 2: INVESTIGATE THE DIFFERENCE

Did the measurements match? Yes ☐ No ☐

If they differed, what might have caused the difference?

- ☐ measured at different places
- ☐ tape was not level or straight
- ☐ tool was read differently
- ☐ different units were used
- ☐ result was rounded differently
- ☐ another reason: _____

Do we need another measurement? Yes ☐ No ☐

Explain why: _____

_____

_____

PART 3: WHY DO FORESTERS MEASURE?

Careful measurements help foresters:

- monitor tree growth
- compare different parts of a forest
- decide when trees may be ready for harvest
- plan equipment and work
- maintain accurate records
- check whether management actions are effective

PART 4: APPLY YOUR THINKING

Choose one use above. Explain why accurate and consistent measurement would matter.

_____

_____

_____

PART 5: REFLECT

Our results were similar or different because...

_____

_____

We made our method more consistent by...

_____

_____

One thing we would do differently next time is...

_____

_____

SUCCESS CRITERIA

I can:

- estimate before measuring
- select an appropriate tool and unit
- repeat and compare measurements
- calculate the difference
- explain possible sources of variation
- describe how foresters use measurement



THINK LIKE A FORESTER

ESTIMATE • MEASURE • CHECK • EXPLAIN

Discover Forestry is powered by the generosity of our sector. Ngā mihi nui to our major supporters.
Email us for more information at discover@discoverforestry.co.nz.

WIDE TRUST

The Wood Industry Development and Education (WIDE) Trust is a charitable trust established in 2018 with the mission to support development and education in the forestry and wood industry sectors through the provision of grants and scholarships to New Zealand students and institutions.

FOREST GROWERS LEVY TRUST (FGLT)

The Forest Growers' Levy Trust collects the commodity levy paid on harvested wood material from forest growers and acts as the custodian of those funds. The Trust ensures the levy is invested in research, development, biosecurity, promotion and other industry-good activities that benefit New Zealand's plantation forest sector.