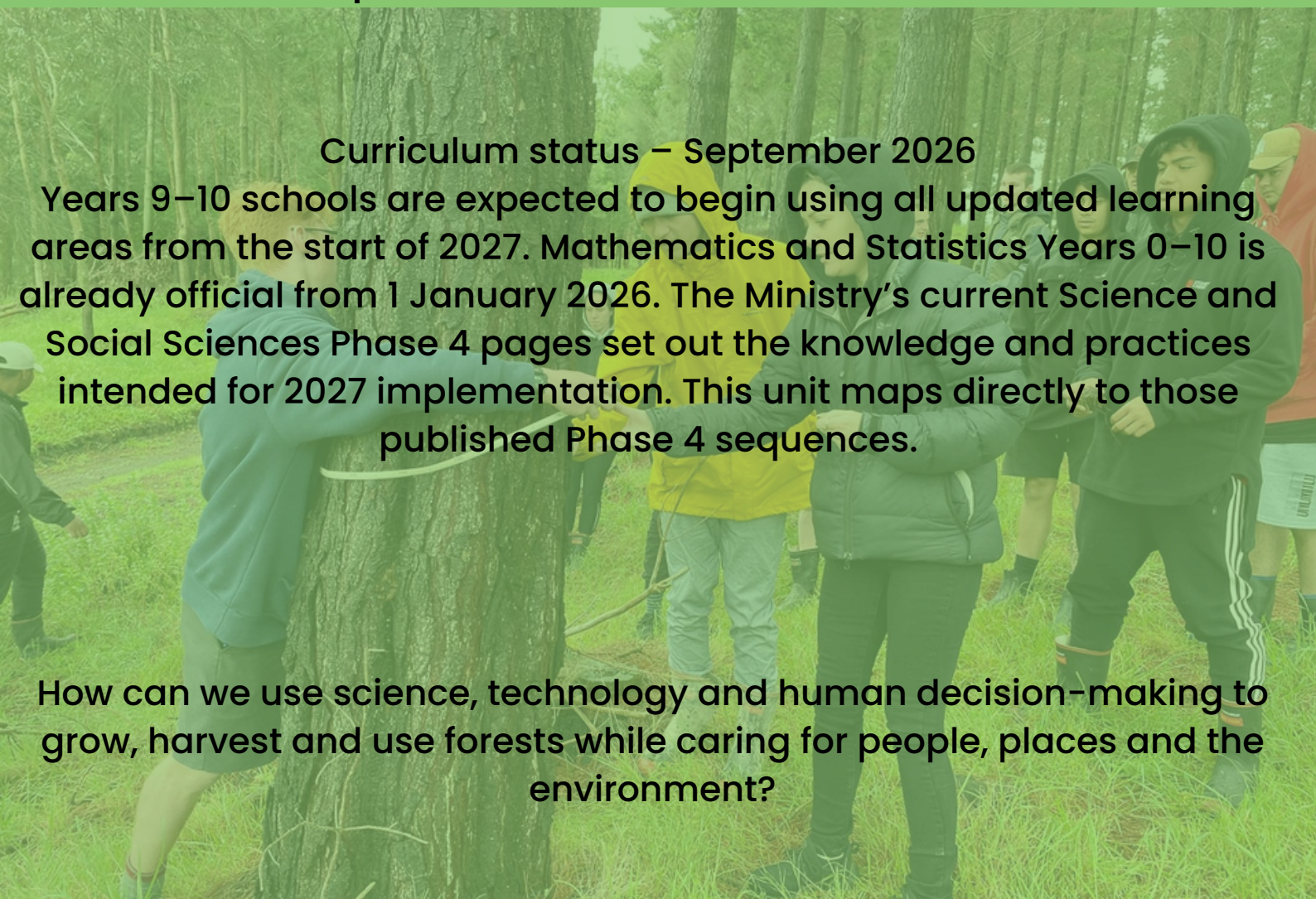
DISCOVER FORESTRY NEW ZEALAND

NGĀHERE O AOTEAROA: GROWTH, GUARDIANSHIP AND GREEN FUTURES

PHASE 4 - YEAR 9 AND 10

In this unit, you are not just students—you are foresters, engineers, environmental scientists, and decision-makers responsible for the future of forests in Aotearoa



Curriculum status – September 2026

Years 9–10 schools are expected to begin using all updated learning areas from the start of 2027. Mathematics and Statistics Years 0–10 is already official from 1 January 2026. The Ministry's current Science and Social Sciences Phase 4 pages set out the knowledge and practices intended for 2027 implementation. This unit maps directly to those published Phase 4 sequences.

How can we use science, technology and human decision-making to grow, harvest and use forests while caring for people, places and the environment?

UNIT OVERVIEW

Element	Ngāhere o Aotearoa Design
Year Level	Years 9–10 / Phase 4
Suggested Duration	6–8 weeks; approximately 20 modular learning experiences
Planning Model	Understanding by Design (UbD)
Core Learning Areas	Science; Social Sciences; Mathematics and Statistics
Strong Supporting Connections	Technology; English; Careers Education; Local Curriculum
Authentic Context	Aotearoa New Zealand plantation forestry, environmental management, harvesting, measurement, transport, ports, trade and global markets
Culminating Performance Task	Forestry Futures Decision Brief
Central Idea	Forestry is an interconnected system in which ecosystems, people, technology, data and economies influence one another.

Unit Rationale

Forestry provides an authentic context for integrated learning because one real-world system brings together ecology, forces and motion, measurement, statistics, trade, transport, technology, environmental management and human decision-making. Students are not simply learning facts about forestry. They are learning disciplinary knowledge and practices, then applying them to real decisions.

Teacher Adaptation and Extension
Ngāhere o Aotearoa is designed as a flexible, curriculum-aligned framework rather than a fixed script.
Teachers are encouraged to adapt, extend, combine or replace activities to reflect their students, local environment, available expertise and areas of particular interest.
The unit identifies the core knowledge, practices and enduring understandings that should remain visible. Beyond these, teachers should look for opportunities to deepen learning through local contexts, current issues, fieldwork, industry expertise, mātauranga Māori, data, technology and student inquiry.

Possible areas for further learning include:

- local forest ecosystems, biodiversity and water;
- mātauranga Māori and relationships with ngahere, whenua and wai;
- GIS, remote sensing and forest technology;
- engineering, roading and harvesting systems;
- carbon, climate change and the ETS;
- wood processing and engineered timber;
- ports, shipping and global supply chains;
- forestry careers and pathways;
- local environmental challenges and restoration;
- statistical investigations using authentic forestry data.

Teachers may also choose to give greater emphasis to one learning area while maintaining the unit's central ideas and transfer goals.

Overarching enduring understanding

Forestry is a complex interconnected system in which natural environments, people, technology, data, communities and global economies influence one another. Understanding these connections enables people to make informed decisions about environmental sustainability, safety, resource use and economic activity.

Transfer goal

Ākonga will independently apply scientific, mathematical and social-science knowledge to an unfamiliar forestry or resource-management problem. They will use evidence to explain the system, evaluate options and justify a practical response that considers environmental sustainability, safety, people and economic outcomes.

STAGE 1 – DESIRED RESULTS

Established curriculum goals

The unit is intentionally selective. It teaches curriculum content that the forestry context can address deeply and authentically rather than attempting to cover every Phase 4 requirement.

Science – Phase 4

·Ecosystems: biotic and abiotic factors can affect the distribution and abundance of organisms, and changes in one part of an ecosystem can affect the balance and wellbeing of the whole system.

·Environmental impacts of human activity: resource extraction and other human activities can affect habitat, biodiversity and ecosystem stability; sustainable practices can reduce impacts and support protection, regeneration and restoration.

·Motion and forces: the action of forces on the movement of objects can be described using Newton's Laws of Motion.
·Force practices: students measure and compare forces in practical contexts, represent forces using free-body diagrams, calculate or reason about force, mass, acceleration and net force, and investigate resistance forces.

·Scientific practices: students model systems, interpret data, investigate phenomena, evaluate evidence and research interventions or solutions.

Social Sciences – Phase 4: Economic Activity

·Year 9 – New Zealand in the global economy: main areas of export include rough wood, and top export destinations include China and India.

·Year 9 practice: analyse maps, statistics, graphs and economic information to explain New Zealand's interdependent relationships with key trade partners and its role in international trade networks.

·Year 10 – Understanding the global economy and international development: development can be measured using indicators such as GDP per capita, life expectancy, infant mortality, literacy and expected years of schooling.

·Year 10 – Geography and economic production: goods are produced in response to human and physical geography, trade can generate wealth, and production and exporting can create environmental challenges.

·Social-science practices: interpret evidence, identify patterns, compare perspectives, explain consequences and evaluate decisions.

STAGE 1 – DESIRED RESULTS

Established curriculum goals

The unit is intentionally selective. It teaches curriculum content that the forestry context can address deeply and authentically rather than attempting to cover every Phase 4 requirement.

Mathematics and Statistics – Phase 4

·Measurement: use appropriate units, accuracy and precision; extend understanding of area and volume in practical contexts.

·Statistics: Year 9 students work with multivariate data and statistical questions; Year 10 extends this through sampling and inference.

·Statistical practices: investigate, represent and explain patterns, trends, variation and relationships using data visualisations.

·Mathematical communication: use calculations, graphs, tables and reasoning to make sense of authentic situations.

ENDURING UNDERSTANDINGS

·Ecosystems are interconnected systems. Changing one part of a forest can affect soil, water, organisms, biodiversity and future productivity.

·Human use of forests creates impacts and opportunities. Sustainable management requires deliberate choices that reduce harm, protect important values and support regeneration over time.

Te ao Māori provides ways of understanding the relationships between people, whenua, ngahere, wai and other living things. Concepts such as whakapapa, kaitiakitanga, mauri and intergenerational responsibility can contribute to thinking about how forests and forest resources are managed in Aotearoa New Zealand.

·Forces and motion explain how logs and forestry machinery move. Newton's Laws provide models that can be used to explain, predict and improve safety and efficiency.

·Accurate measurement and trustworthy data matter because uncertainty, sampling and error can change operational, environmental and economic decisions.

·A local forestry operation is part of a wider supply chain and global economy. Markets, trade relationships, infrastructure, weather, regulation and geography can influence local decisions.

·Different people and groups may value different outcomes. Good decisions require evidence, consideration of consequences and transparent reasoning rather than a single simplistic answer.

STAGE 1 – DESIRED RESULTS

Essential Questions

1.How do forestry activities affect ecosystems, and how can those effects be managed?

2.How can mātauranga Māori, values and perspectives help us make responsible decisions about ngahere and forestry in Aotearoa?

3. How do forces and Newton's Laws explain the safe movement of logs and the operation of forestry machinery?

4. How does a tree in a New Zealand forest become part of a national and global supply chain?

5. How do accurate measurement and statistical reasoning influence safety, efficiency, environmental management and profitability?

6. How should environmental, economic and community interests be balanced when making forestry decisions?

7. How can scientific and social-science evidence help us make better decisions about the future of forests?

Students will know

Learning area	Knowledge to be developed
Science – ecosystems	Ecosystem organisation; biotic and abiotic factors; interdependence; biodiversity; environmental impacts; conservation, regeneration and restoration; links between vegetation, soil and water.
Science – forces	Force, mass, gravity, friction, tension, load, acceleration, net force, inertia, free-body diagrams and Newton's Laws; practical applications in log movement and forestry machinery.
Social Sciences	Exports, imports, trade partners, interdependence, primary/secondary/tertiary activity, supply chains, global markets, development indicators, physical and human geography, sustainability and trade-offs.
Mathematics & Statistics	Length, diameter, radius, volume, units, accuracy, precision, uncertainty, categorical and numerical variables, multivariate data, statistical questions, data displays, sampling and limitations.
Forestry context	Plantation forest cycle; harvesting and replanting; road/transport/port systems; environmental management; forestry occupations; traceability and measurement across the supply chain.
Te ao Māori and relationships with te taiao	Whakapapa, kaitiakitanga, mauri, whenua and wai, intergenerational whakaaro, Māori as forest owners, investors, workers, scientists, managers and decision- makers in contemporary forestry.

STAGE 1 – DESIRED RESULTS
ESSENTIAL QUESTIONS

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STUDENTS WILL BE ABLE TO

- ask focused questions about authentic forestry phenomena and problems;
- construct and use models to explain forest ecosystems and physical systems;
- observe, measure, collect and record evidence systematically;
- use free-body diagrams and Newton's Laws to explain movement in forestry contexts;
- create and interpret maps, graphs, tables and data visualisations;
- identify patterns, relationships, uncertainty and limitations in evidence;
- explain local-to-global connections in the forestry supply chain;
- compare options and evaluate consequences from more than one perspective;
- design, test and refine a practical solution;
- construct and communicate an evidence-based recommendation for a defined audience;
- reflect on their learning and transfer their reasoning to another context.



STAGE 2 – ASSESSMENT EVIDENCE

DISCOVER FORESTRY NEW ZEALAND

CULMINATING PERFORMANCE TASK: FORESTRY FUTURES DECISION BRIEF

Students take the role of a forestry decision-making team.
They receive an authentic scenario involving a New Zealand forestry operation and must recommend a course of action. The scenario should require them to integrate knowledge rather than complete three separate subject tasks.

Suggested scenario: A steep harvesting block has recently experienced heavy rainfall. Part of the block has increased erosion risk, a ship is due at the port, and there is pressure to maintain supply. Students must decide how operations should proceed and justify their recommendation.

OTHER SCENARIO OPTIONS

· Overseas demand rises suddenly and the business is under pressure to increase harvest volume.
· A planned harvesting area is close to an important habitat or riparian protection area.
· A forest road becomes unsafe after sustained rainfall, disrupting transport to the port.
·A measurement discrepancy creates uncertainty about log volume, load planning and sale value.
·A business is considering a new extraction system that is safer but more expensive.
·A port disruption means only some logs can be shipped and priorities must be set.

REQUIRED EVIDENCE IN THE FINAL TASK

·A systems map showing relevant ecological, cultural/intergenerational, operational and economic connections.
·At least one scientific explanation using ecosystems, forces, or both.
·At least one mathematical or statistical analysis using calculations, data or a graph.
·Evidence from at least two credible sources or datasets.
·Consideration of at least three stakeholder perspectives.
·A comparison of realistic options using explicit criteria.
·A clear recommendation supported by evidence and reasoning.
·One identified uncertainty or limitation and an explanation of how it affects confidence in the decision.

STAGE 2 – ASSESSMENT EVIDENCE

Assessment criteria

Criterion	Developing	Secure	Strong evidence of transfer
Ecosystems & sustainability	Identifies an environmental effect.	Explains cause and effect and a management response.	Evaluates options using evidence about ecosystem consequences and long-term sustainability
Forces & motion	Identifies forces in a situation.	Explains movement using appropriate force concepts/Newton's Laws.	Uses scientific models to predict or compare outcomes and links them to safety and efficiency.
Data & measurement	Records or displays data.	Uses appropriate measurements, calculations and/or graphs.	Interprets patterns, precision, uncertainty and limitations and uses evidence to support a decision.
Global economy & supply chains	Describes part of the supply chain.	Explains local-to-global connections and interdependence.	Evaluates how market, geographic or operational changes affect several parts of the system.
Decision making	States a preference.	Makes a supported recommendation.	Balances competing interests, acknowledges trade-offs and justifies a feasible response.
Communication	Communicates the main idea	Uses clear structure and subject vocabulary.	Communicates a coherent, evidence-rich argument and responds convincingly to questions.

STAGE 2 – ASSESSMENT EVIDENCE

Formative assessment evidence

DISCOVER FORESTRY NEW ZEALAND

·Entry concept map / "What do I think I know about forestry?"
·Ecosystem cause-and-effect matrix
·Force diagrams and physics station results
·Export pathway/supply-chain map
·Supply-chain simulation decision log
·Multivariate tree-growth data investigation
·Measurement and precision investigation
·Claim–Evidence–Reasoning responses
·Peer critique of the draft Forestry Futures Decision Brief
·End-of-unit reflection and revised concept map

STAGE 3 – LEARNING PLAN

Schools can teach these as individual lessons, combine them into longer blocks, or distribute them across science, social sciences and mathematics & statistics classes.
The important feature is the sequence: build knowledge first, then integrate and transfer it.

Essential questions

How do human activities in forestry impact ecosystems, and how can sustainable practices protect and restore them?

How do forces, including Newton's Laws, affect the operation of forestry machinery and the safe movement of logs?

How does New Zealand's forestry industry connect to global trade and the national economy?

How can data, measurement, and statistical reasoning inform decisions in forestry?

How does precision and accuracy in measurement affect safety, efficiency, and profitability in forestry operations?

How can learning about forestry help me make informed, sustainable, and practical choices in the future both in career opportunities and everyday life?

1. Enter the Forest System

Purpose: Launch the unit and reveal prior knowledge.

Driving question: How is a forest connected to people, machinery, water, wildlife and markets?

Learning sequence

· Introduce the unit challenge: How can we make informed decisions about the future of forests?
· Show contrasting images of a standing plantation forest, harvested area, replanting, log truck, port and wood product.
· Students create an initial systems map showing everything they believe is connected to forestry.
· Introduce the six essential questions.

Evidence of learning: Diagnostic concept map and student questions.

Curriculum alignment: Integrated introduction; provides a baseline for later transfer.

Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

2. Forest Ecosystems: What Changes When We Harvest?

Purpose: Develop ecosystem knowledge and causal reasoning.

Driving question: How can changing one part of a forest system affect other parts?

Learning sequence
· Compare an intact plantation forest, recently harvested site and replanted site.
· Build a Forestry Impact Matrix: soil, erosion, water, biodiversity, carbon and future productivity.
· Use a simple rainfall/runoff model to investigate vegetation cover and erosion.
· Students explain one impact and one management response using cause-and-effect reasoning.

Evidence of learning: Impact matrix and short scientific explanation.

Curriculum alignment: Science: ecosystems; environmental impacts of human activity; modelling.

Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

FOREST SYSTEMS INVESTIGATION

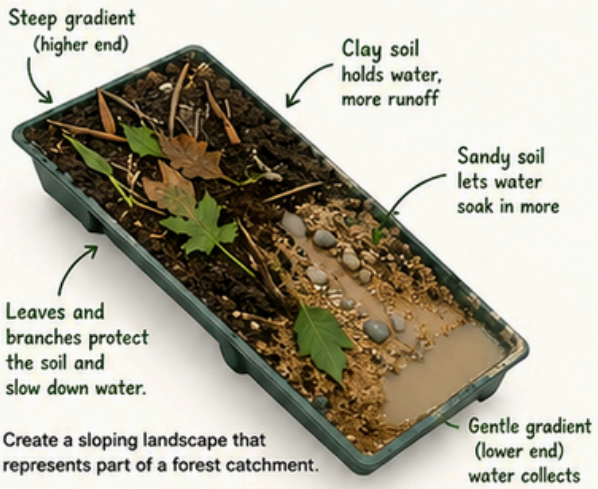
How do slope and ground cover affect erosion and runoff?

Investigate how changes within a forest system can affect soil and water, and use evidence to explain how forestry practices can reduce environmental impacts.

1. SET UP YOUR MODEL

You will need:

- a shallow tray
- soil or similar material
- leaves, twigs and other ground cover
- small stones
- a water bottle with holes in the lid or small watering can
- a container to collect runoff
- something to raise one end of the tray
- ruler or measuring cup (if you want to collect quantitative data)



Create a sloping landscape that represents part of a forest catchment.

Test different conditions such as:

A. Ground covered with leaves and vegetation
B. Ground with little or no cover
(For a more advanced investigation, compare different gradients.)

2. PREDICT

Before adding water, make a prediction.

What do you think will happen to the water?

Consider:

- How quickly will water move?
- Where might water collect?
- Which condition might produce more runoff?
- Where might more soil be moved?
- How might ground cover affect erosion?

MY PREDICTION:

I predict _____

because _____

_____

3. INVESTIGATE

Apply approximately the same amount of water at the same rate to each model. Observe what happens.

Where possible, measure:

Evidence	Model A (Ground covered)	Model B (Little or no cover)
Amount of water added		
Runoff collected (mL)		
Time until runoff begins (s)		
Amount of visible soil movement (low / medium / high)		
Water clarity / turbidity (clear / slightly cloudy / cloudy / muddy)		

Fair test: What needs to stay the same so that we can fairly compare our models?

_____

_____

4. OBSERVE AND EXPLAIN

Use your evidence to answer:

- Which model produced more runoff?
- Where did water move fastest?
- Where was the greatest soil movement?
- What difference did ground cover make?
- What evidence supports your conclusion?

CLAIM – EVIDENCE – REASONING

CLAIM: What do you think your investigation shows?

_____

_____

EVIDENCE: What did you observe or measure?

_____

_____

REASONING: Why does your evidence support your claim?

_____

_____

5. CONNECT IT TO FORESTRY

In forestry, when trees are harvested, the way water moves through a site can change. Managers need to consider factors such as slope, rainfall, soil, ground disturbance, roads, stream crossings and vegetation cover.

Based on your investigation, what could forestry managers do to reduce erosion and sediment entering waterways?

_____

_____

_____

_____

_____

Ideas to consider:

- retain vegetation beside waterways
- reduce unnecessary soil disturbance
- manage runoff from forest roads
- plan harvesting carefully on steep or erosion-prone land
- re-establish vegetation
- protect riparian areas

6. REFLECT AND TRANSFER

A forestry company is preparing to harvest a steep block of land before a period of heavy rainfall.

What would you recommend they consider before work begins? Use evidence from your investigation to justify your answer.

_____

_____

_____

_____

SUCCESS CRITERIA

I can:

- identify factors that affect runoff and erosion
- conduct a simple investigation and make observations or measurements
- use evidence to explain how slope and ground cover influence water and soil movement
- explain how changes to one part of a forest system can affect other parts
- apply my findings to a forestry situation
- justify an environmental management recommendation using evidence

FORESTS HELP PROTECT OUR SOIL AND OUR WATERWAYS.

3. Sustainable Forestry: What Does Sustainable Mean?

Purpose: Deepen the concept of sustainability.

Driving question: What evidence would show that a forestry practice is sustainable over time?
Learning sequence

·Unpack sustainability as meeting current needs while protecting future capability.
·Examine replanting, riparian protection, erosion control, habitat protection, road planning and operational limits.
·Students rank management options against agreed environmental and practical criteria.
·Discuss why sustainability is a judgement based on evidence and context, not a label.

Evidence of learning: Justified ranking using criteria.

Curriculum alignment: Science + Social Sciences: sustainability, consequences and decision-making.

Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

4. Forests, People and Place

Purpose: Recognise multiple values and perspectives.

Driving question: Who values a forest, and why?
Learning sequence
· Map a local forestry landscape and identify people and groups connected to it.
· Consider workers, whānau, landowners, mana whenua, local communities, businesses, regulators and environmental interests.
· Where locally appropriate, explore kaitiakitanga, mauri, whakapapa and relationships with te taiao through authentic local knowledge.
· Identify one tension and one shared interest.

Evidence of learning: Stakeholder/value map.

Curriculum alignment: Social Sciences: people, place, perspectives and local context.

Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

5. Forces in Forestry: What Makes a Log Move?

Purpose: Build foundational physics knowledge.
Driving question: What forces act when a log starts, stops or changes direction?

Learning sequence
· Investigate gravity, friction, applied force, tension and load using simple materials.
· Represent forces using arrows and simple free-body diagrams.
· Compare moving a load on flat and sloping surfaces and across different materials.
· Introduce newtons (N), net force, balanced/unbalanced forces and inertia.

Evidence of learning: Annotated force diagrams and recorded observations.

Curriculum alignment: Science: Motion and Forces.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

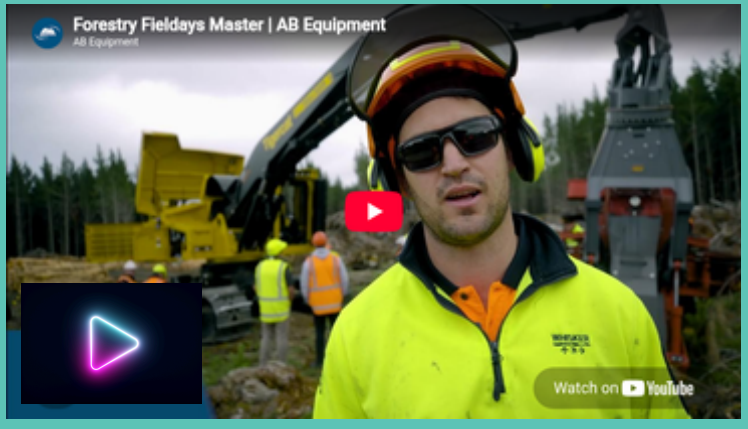
6. Newton's Laws in Logging Operations

Purpose: Apply formal physics knowledge to authentic machinery.
Driving question: How do Newton's Laws help explain forestry operations?

Learning sequence
·Use video or images of a swing yarder, hauler, grapple or log-loading operation.
·Identify examples of inertia, F = ma, action/reaction and friction.
·Students explain starting, stopping, accelerating and changing direction.
·Connect scientific explanation to safety and operational control.

Evidence of learning: Claim–Evidence–Reasoning explanation.

Curriculum alignment: Science: Newton's Laws and practical force contexts.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.





7. Applied Physics Stations

Purpose: Measure and compare forces in practical contexts.
Driving question: How do slope, friction and pulley systems change the force needed?

Learning sequence
·Station 1: gravity and slope using ramps.
·Station 2: friction across different surfaces.
·Station 3: pulley/cable systems.
·Record force and movement; compare safety and efficiency.

Evidence of learning: Completed station investigation sheet.

Curriculum alignment: Science practices + Mathematics measurement.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.



8. Design Challenge: Mini Cable Logging System

Purpose: Apply physics through design, testing and refinement.

Driving question: How can we move a load uphill safely and efficiently?

Learning sequence
·Design a miniature pulley, ramp or cable system.
·Predict what will happen and identify the forces involved.
·Test at least three times, changing one feature deliberately.
·Explain how testing evidence led to design improvements.

Evidence of learning: Prototype, test record and evaluation.

Curriculum alignment: Science; strong optional Technology connection.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.



NGĀHERE O AOTEAROA
APPLIED PHYSICS WORKSHEET

FORCES IN FORESTRY: STATIONS & DESIGN CHALLENGE – YEAR 9/10

Name: _____

Date: _____

Group Members:

1. _____
2. _____
3. _____
4. _____

LEARNING FOCUS

How do forces affect movement, safety, and efficiency in forestry systems? Apply physics principles to investigate, compare and design solutions for real forestry challenges.

THINK LIKE A FORESTER!

How could understanding forces help people work safely and protect the forest?

INSTRUCTIONS: Rotate through each station. Test, observe, and record what happens. Use evidence to compare systems and inform your design solution in Part 3.

1 STATION 1: GRAVITY & SLOPE (RAMPS)



What did you test? (angle, height, surface)

_____

Observation	What happened?
Movement	
Force needed to start moving	
Speed of movement	
Control / Stability (Safety)	

What did you notice about gravity and slope?

_____

_____

IDEA:
How might steeper slopes affect the force needed to move logs or equipment?

2 STATION 2: FRICTION (DIFFERENT SURFACES)



Wood Gravel Metal

Surfaces tested: _____

Surface	Easy or Hard to move?	Why?
1		
2		
3		

How did friction affect movement?

_____

_____

Which surface was most efficient? Why?

_____

_____

IDEA:
Forestry machinery, vehicles and logs interact with different surfaces. Why is reducing or increasing friction important?

3 STATION 3: PULLEY SYSTEMS (CABLE LOGGING SIMULATIONS)



System used (simple pulley / multiple pulleys):

_____

Observation	What happened?
Force needed to lift	
Ease of lifting	
Control of load	
Efficiency	

What did you notice about pulleys and force?

_____

_____

IDEA:
How do pulley systems help reduce the force needed and improve safety in forestry?

PART 2: COMPARE & THINK

Which system required the LEAST force? Why? _____

Which system was SAFEST? Why? _____

Which system was most EFFICIENT? Why? _____

How do forces, friction and pulleys work together in real forestry operations? _____

PART 3: DESIGN CHALLENGE – MINI CABLE LOGGING SYSTEM

TASK: Design a system to move a load uphill safely and efficiently using physics principles.

MY DESIGN SKETCH

Draw your system below. Label the key parts and the direction of the forces.

MY DESIGN PLAN

What materials did you use? _____

_____

How does your system work? _____

_____

How does it reduce the force needed? _____

_____

How did you make it safe? _____

_____

How will it protect the forest and the workers? _____

_____

PART 4: TEST & IMPROVE

Test	What worked well?	What didn't work?	Improvement made
1			
2			
3			

PART 5: REFLECTION & APPLY

What did you learn about forces in forestry? _____

What would you do differently next time? _____

Where might this knowledge be used in real forestry? _____

_____

THINK LIKE A FORESTER: TEST. IMPROVE. BUILD. A GREENER FUTURE.

CHALLENGE EXTENSION (OPTIONAL)

How could your design be improved for:

- Steeper terrain? _____
- Heavier loads? _____
- Real-world forestry use (safety, efficiency, environment)?

_____



SUCCESS CRITERIA

I can:

- identify forces acting on objects and systems in forestry
- investigate and collect evidence about how forces affect movement
- explain how forces, friction and pulleys influence efficiency and safety
- use evidence to compare systems and justify my conclusions
- design, test and improve a system to solve a forestry challenge
- communicate my ideas clearly using physics vocabulary and diagrams

DISCOVER FORESTRY NEW ZEALAND

9. From Forest to Port

Purpose: Build understanding of supply chains.

Driving question: How does a tree become part of a national and global supply chain?

Learning sequence
·Map forest → harvesting → skid/landing → road → truck → port → ship → customer/processor.
·Add people, technologies, information and decision points.
·Use a local port or processing example where possible.
·Identify points where weather, safety, environmental limits or logistics can disrupt the chain.

Evidence of learning: Annotated supply-chain map.

Curriculum alignment: Social Sciences: Economic Activity; interdependence.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

HTTPS://WWW.NZFOA.ORG.NZ/PLANTATION-FORESTRY/EXPORTS



10. New Zealand in the Global Economy

Purpose: Teach the required global trade knowledge explicitly.

Driving question: Where does New Zealand forestry fit in global trade?

Learning sequence
·Use current data to identify New Zealand's main exports and the place of rough wood/wood products.
·Map China, United States, Australia, Japan and South Korea as key export destinations.
·Distinguish primary, secondary and tertiary economic activity using forestry examples.
·Explain one way global demand can affect a local operation.

Evidence of learning: Map plus short evidence-based explanation.

Curriculum alignment: Social Sciences Year 9: New Zealand in the global economy.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

11. Geography of Production

Purpose: Explain why forestry and processing occur where they do.

Driving question: How do physical and human geography shape economic production?

Learning sequence
·Examine climate, slope, soils, land availability, roads, workforce, mills, ports and infrastructure.
·Compare two New Zealand forestry regions or a New Zealand region with an overseas producer.
·Identify advantages, constraints and transport implications.
·Explain how geography affects cost, risk and opportunity.

Evidence of learning: Comparative geographic explanation.

Curriculum alignment: Social Sciences Year 10: geography and economic production.

Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

FOREST EXPORT DECISION CHALLENGE

We are forestry exporters in Aotearoa New Zealand.
We must balance economic, social, cultural and environmental factors.





OUR BIG DECISION

We must make TWO key choices:

- ☐ Sell locally OR ☐ Export overseas
- ☐ Increase harvest OR ☐ Protect the environment

There are no perfect answers.
Think about short-term and long-term impacts.
Use evidence to decide.

1 WHAT DO WE KNOW?

Write key facts from our learning about forestry, trade and the environment.

_____

_____

_____

_____

_____

2 OPTIONS TABLES

Consider the benefits and risks of each option. Use evidence from our learning, maps, case studies, data and discussions.

A. SELL LOCAL OR EXPORT OVERSEAS?

OPTION	BENEFITS	RISKS
Sell locally		
Export overseas		

B. INCREASE HARVEST OR PROTECT THE ENVIRONMENT?

OPTION	BENEFITS	RISKS
Increase harvest		
Protect the environment		

Think about: economy • people • jobs • communities • environment • culture • reputation • future generations

3 WHO IS AFFECTED?

Think about different people and groups.
What do they want? How are they impacted?



GROUP	WHAT DO THEY WANT?	HOW ARE THEY IMPACTED?
Local community		
Workers		
Environment & waterways		
Government & economy		
Future generations		

4 OUR DECISION

✓ Tick our choices:

Sell locally

- ☐ Sell locally
- ☐ Export overseas

Manage the forest

- ☐ Increase harvest
- ☐ Protect the environment

Explain our overall decision in one sentence:

_____

5 OUR REASONING

We chose these options because:

_____

_____

_____

_____

We used evidence such as:

- data / maps / case studies _____
- costs and benefits _____
- environmental impacts _____
- people's views _____

6 REFLECTION

One challenge in making this decision was:

_____

_____

If we had more information, we might:

_____

★ EXTENSION CHALLENGE

Can we design a balanced solution that:

Makes money | Protects the environment | Supports jobs

Our idea: _____

_____

_____

SUCCESS CRITERIA

I can:

- identify and apply forces concepts from our stations
- use evidence to compare options and systems
- explain impacts on people, places and environments
- justify a decision considering short and long term
- communicate my ideas clearly using data, diagrams and writing

12. Supply Chain Simulation

Purpose: Experience interdependence and decision-making under constraints.

Driving question: What happens when one part of a supply chain changes?

Learning sequence
·Assign roles: forest manager, logging contractor, transport operator, port/export manager and community/environment representative.
·Introduce scenario cards: heavy rain, port deadline, demand surge, biodiversity restriction, road closure.
Groups make decisions and record intended and unintended consequences.
·Debrief which change had the greatest ripple effect and why.

Evidence of learning: Decision log and debrief explanation.

Curriculum alignment: Social Sciences practices: systems, consequences, perspectives.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

13. Trade-offs: Can We Have Everything?

Purpose: Evaluate choices rather than treat them as simple either/or decisions.

Driving question: How can competing environmental, social and economic goals be balanced?

Learning sequence
·Use the Forest Export Decision Challenge or a locally adapted version.
·Compare sell locally/export; harvest more/maintain limits; short-term gain/long-term resilience.
·Consider workers, communities, environment, business, government and future generations.
·Challenge students to develop a balanced option with explicit criteria.

Evidence of learning: Decision matrix and justification.

Curriculum alignment: Social Sciences: economic reasoning, perspectives and sustainable decision-making.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

SCENARIO 1: WET WEATHER (ROAD CLOSURES)

Heavy Rainfall Alert

Situation:

Days of heavy rain have caused forest roads to become slippery and unsafe.

Impact:

- Reduced truck access to harvesting sites
- Delays in log transport

Your Challenge:

What do you do with harvesting and transport today?

Think about:

- Do you pause harvesting?
- Do you stockpile logs in the forest?
- Do you risk slower transport?

Port Deadline Pressure

Situation:

The port has limited shipping slots this week.

Impact:

- Only some shipments can be loaded
- Missed slots = financial penalties

Your Challenge:

Which logs do you prioritise for export?

Think about:

- Grade/quality of logs
- Contract obligations
- Transport timing

HIGH DEMAND (EXPORT PRESSURE)

Export Surge

Situation:

Overseas buyers have increased demand for logs this month.

Impact:

Higher export prices available

Pressure to increase supply immediately

Your Challenge:

Do you increase harvesting or maintain sustainability limits?

Think about:

Short-term profit vs long-term forest health

Workforce capacity

ENVIRONMENTAL RESTRICTIONS

Harvesting Limits Introduced

Situation:
New environmental rules reduce allowable harvesting areas.

Impact:
- Less wood available for export
- Some operations must stop temporarily

Your Challenge:
How do you adjust operations?

Think about:
- Which areas are still permitted?
- Do you shift crews or pause work?

Erosion Risk Warning

Situation:
A hillside block has been identified as high erosion risk.

Impact:
- Logging in that area is restricted

Your Challenge:
What changes do you make to protect the environment?

Think about:
- Alternative harvest sites
- Road protection measures
- Reduced extraction rates

Biodiversity Protection Zone

Situation:
A section of forest has been designated as a protected habitat zone.

Impact:
- No logging allowed in that area
- Reduced total harvest volume

Your Challenge:
How do you maintain business output while respecting restrictions?

Think about:
- Efficiency improvements
- Better coordination
- Selective harvesting

14. Forestry Data: What Affects Tree Growth?

Purpose: Develop multivariate statistical reasoning.

Driving question: What patterns in data could help a forester make a planting decision?

Learning sequence
·Use the existing age–soil type–height dataset or local data.
·Identify categorical and numerical variables and the statistical question.
·Create appropriate visualisations and describe relationships.
·Make a recommendation while clearly identifying a limitation; avoid claiming causation unless evidence supports it.

Evidence of learning: Graph and written conclusion.

Curriculum alignment: Mathematics & Statistics: multivariate data and relationships.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

15. Measurement, Precision and Timber Volume

Purpose: Connect measurement quality to real consequences.
Driving question: How can a small measurement difference change a forestry decision?

Learning sequence
·Measure log/object length and diameter using repeated trials.
·Calculate approximate cylinder volume.
·Compare results and discuss accuracy, precision and uncertainty.
·Model effects of over- or under-estimation on pricing, transport or planning.

Evidence of learning: Measurement table, calculation and Claim–Support–Question response.

Curriculum alignment: Mathematics: measurement, volume, accuracy and precision.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

TREE GROWTH INVESTIGATION

Age, Soil Type & Forest Conditions

Name: _____

Date: _____

Group Members: _____

Foresters want to understand how soil and other factors affect tree growth over time so they can make better decisions for the future.

YOUR TASK:

Look at the data and graph.
What patterns do you notice?

DATASET: Tree Height vs Age and Soil Type

Tree ID	Age (years)	Soil Type	Height (m)	Annual Growth (cm/year)
T1	2	Clay	1.8	–
T2	2	Sandy	1.5	–
T3	2	Loam	2.2	–
T4	5	Clay	4.5	90
T5	5	Sandy	3.8	76
T6	5	Loam	5.6	113
T7	8	Clay	7.2	90
T8	8	Sandy	6.1	78
T9	8	Loam	8.5	100
T10	12	Clay	10.5	83
T11	12	Sandy	9.2	78
T12	12	Loam	12.8	100
T13	16	Clay	13.8	83
T14	16	Sandy	12.5	78
T15	16	Loam	16.2	100
T16	20	Clay	16.0	55
T17	20	Sandy	14.6	53
T18	20	Loam	18.5	58

Note: Annual growth is calculated from the previous age interval.

SOIL TYPES

Clay



Holds water well. Can be heavy and slow to drain. High nutrients.

Sandy



Drains quickly. Doesn't hold water or nutrients well. Warms up quickly.

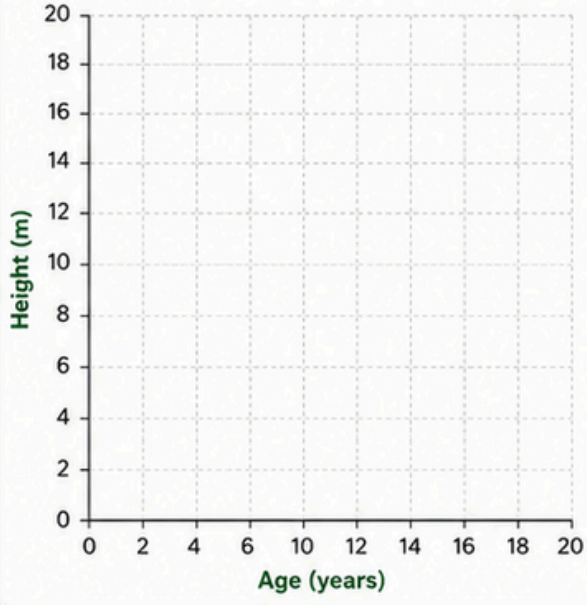
Loam



Good balance. Holds nutrients and water well. Good for growth.

YOUR TURN: Create a Scatter Plot

Tree Height vs Age by Soil Type



PLOT THE DATA:

- Use the table to plot each point.
- Use a different colour for each soil type.
- Add a title and label the axes.

WHAT PATTERNS DO YOU NOTICE?

Write your observations below.

- How does tree height change as trees get older?

  _____

- Which soil type shows the fastest growth? Explain.

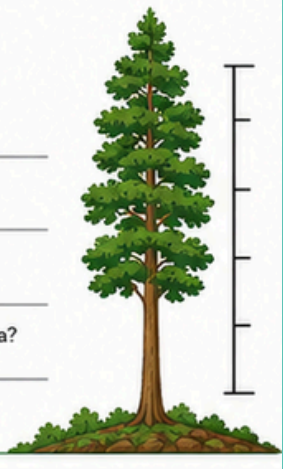
  _____

- Which soil type shows the slowest growth? Explain.

  _____

- Are there any interesting patterns or trends in the data?

  _____



4 EXTENSION QUESTIONS – THINK LIKE A FORESTER!

Use evidence from the data, maps, case studies and your knowledge to answer these questions.

1 Why might loam soil support faster growth?

_____

_____

_____

_____

_____



2 How might drought affect each soil type differently?

_____

_____

_____

_____

_____



3 If you were a forest manager, which soil would you choose for planting? Why?

_____

_____

_____

_____

_____



4 What trade-offs might exist between fast growth and protecting the environment?

_____

_____

_____

_____

_____



SUCCESS CRITERIA

I can:

- interpret and analyse data about growth patterns
- create a clear scatter plot with correct labels
- explain how soil and age affect growth using evidence
- connect data to real forestry decisions and challenges
- communicate my ideas clearly using science vocabulary

GOOD DATA
BETTER DECISIONS
HEALTHIER FORESTS
GREENER FUTURES

16. Data for Decisions

Purpose: Use a fuller statistical inquiry in a forestry context.

Driving question: What makes data strong enough to support a decision?

Learning sequence
·Students investigate a question such as tree growth, erosion indicators, machinery efficiency or transport timing.
·Identify variables and whether data is primary or secondary.
·Collect/use data, visualise it and draw a conclusion.
·Identify sampling issues, limitations and what additional evidence would improve confidence.

Evidence of learning: Mini statistical investigation.

Curriculum alignment: Mathematics & Statistics: investigation, sampling, inference and limitations.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

17. Technology, Measurement and Traceability

Purpose: Understand the information system that sits beside the physical supply chain.

Driving question: How do forestry businesses know what is being measured, moved and exported?

Learning sequence
·Use an industry case study involving scanning, log measurement, tagging, tracking, GIS, remote sensing or port technology.
·Identify the problem each technology solves.
·Map information flow alongside physical log movement.
·Explain why accuracy and traceability matter to safety, payment, logistics and customer confidence.

Evidence of learning: Technology/system explanation
Curriculum alignment: Integrated Science + Mathematics + Social Sciences; optional Technology.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

18. Careers Across the System

Purpose: Make pathways visible without turning the unit into a careers lesson.

Driving question: Who uses this knowledge in real forestry work?

Learning sequence
·Use case studies, short videos or industry visitors: foresters, environmental planners, engineers, GIS specialists, logging/transport operators, port staff, scientists and wood-processing roles.
·Match each occupation to knowledge and practices from the unit.
·Students identify a role and explain the curriculum knowledge it uses.
·Where possible, have an expert respond to a student problem rather than simply give a talk.

Evidence of learning: Career/skills connection profile.

Curriculum alignment: Authentic context and pathway learning.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

19. Forestry Futures Decision Brief

Purpose: Demonstrate integrated transfer.

Driving question: What should we do, and why?

Learning sequence

·Teams analyse their final scenario and define the problem, stakeholders, constraints and criteria.
·Use science, data and social/economic evidence.
·Compare at least two options and identify trade-offs.
·Present a recommendation to peers, teacher or an industry audience and answer questions.

Evidence of learning: Summative performance task.

Curriculum alignment: Integrated assessment of the unit's enduring understandings.
Opportunities for further learning: Teachers may extend this activity using local case studies, fieldwork, industry expertise, additional data or related curriculum content.

FORESTRY MEASUREMENT INVESTIGATION

How accurate are our measurements – and why does it matter?

Name: _____

Date: _____

Group Members: _____

Accurate measurements help foresters make safe, efficient and sustainable decisions that protect people, the environment and the economy.



STARTER ACTIVITY (10 MINS) – THINK, PUZZLE, EXPLORE

Your teacher will show you two different measurements of the same log.

Routine Purpose:

Encourage careful observation, curiosity and thoughtful investigation.

THINK

What do you notice?
Write at least 2 observations:

- _____
- _____

PUZZLE

What puzzles or confuses you about these measurements?

- _____
- _____

EXPLORE

What could you do to figure out which measurement is more accurate?

- _____
- _____

Share your ideas with a partner or group.

MAIN ACTIVITY – HANDS-ON MEASUREMENT

1 MEASURE YOUR LOG / OBJECT

Object: _____

Measure the same log/object carefully three times.

Measurement	Trial 1	Trial 2	Trial 3	Final Estimate
Length (m)				
Diameter (m)				
Notes (e.g. tape not straight, log tapered, bark rough)				

2 CALCULATE VOLUME

Use the cylinder formula to estimate the log volume.

$$V = \pi r^2 h$$

(V = volume, r = radius, h = length)

WORKING:

Radius (r) = _____ m

Height / Length (h) = _____ m

Volume (V) = _____ m^3

3 COMPARE RESULTS

Compare your volume with others in your group.

What differences do you notice?

- _____
- _____

Why might these differences exist?

- _____

THINKING ROUTINE – CLAIM, SUPPORT, QUESTION

CLAIM

What do you think about your measurement?
(e.g., "Our measurement is the most accurate because...")

_____

SUPPORT

What evidence supports your claim?
(e.g., repeated measurements, tools used, method)

_____

QUESTION

What could make your measurement wrong or less accurate?

_____

REAL-WORLD CONNECTION – FORESTRY IMPACT

WHY ACCURACY MATTERS

In forestry, small measurement errors can lead to big problems.

Overestimating volume

- Too much wood is sold.
- Loss of income when actual volume is less.
- Can lead to poor planning and waste.

Underestimating volume

- Missed revenue and opportunities.
- Inefficient use of resources.
- Impacts jobs and the economy.

HANDS-ON CHALLENGE – EXPLORE CONSEQUENCES

PROFIT IMPACT

If your measurement is slightly wrong, how could it affect timber sales?

- _____
- _____

LOAD SAFETY

How could incorrect measurements affect transport safety?

- _____
- _____

SHOW YOUR THINKING

Annotate your calculations or explain your reasoning.

_____

_____

REFLECTION – CONNECT, EXTEND, CHALLENGE

CONNECT

How do these measurement skills relate to real forestry work?

_____

_____

EXTEND

What other forestry tasks require precision?

_____

_____

CHALLENGE

How might these factors affect measurements?

- Human error _____
- Tool limitations _____
- Environmental factors (rain, mud, bark, slope) _____

SUCCESS CRITERIA

- I can measure length and diameter accurately using appropriate tools.
- I can calculate volume using the cylinder formula.
- I can explain why measurements may differ.
- I understand real-world consequences of measurement errors in forestry.

I CAN:

- use measuring tools safely and accurately
- collect and record reliable data
- calculate volume using a formula
- analyse and compare measurements
- explain the importance of accuracy in forestry
- communicate my ideas clearly using evidence

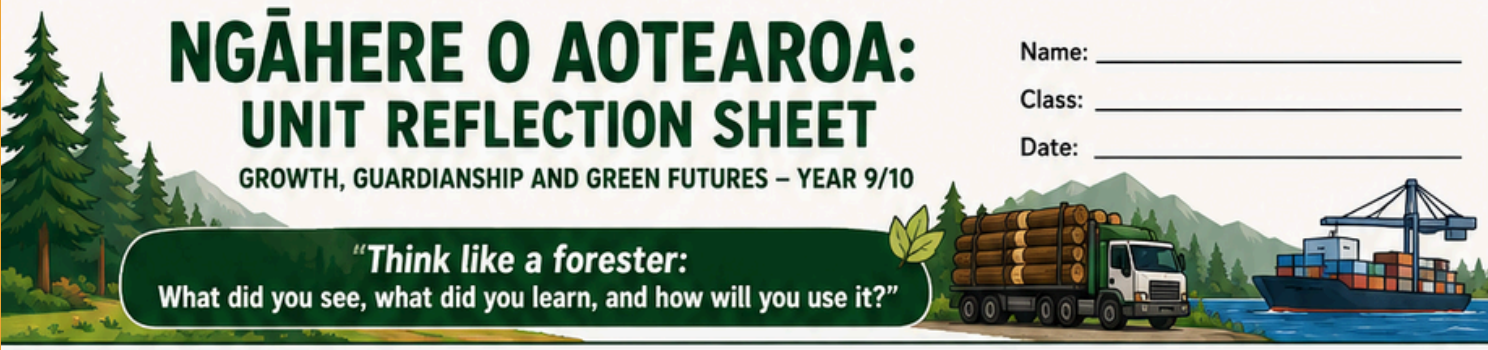
NGĀHERE O AOTEAROA:
UNIT REFLECTION SHEET

GROWTH, GUARDIANSHIP AND GREEN FUTURES – YEAR 9/10

Name: _____

Class: _____

Date: _____



> *"Think like a forester:*
> **What did you see, what did you learn, and how will you use it?"**

PART 1: MY LEARNING SELF-CHECK

Instructions: Read each question. Circle the face that shows how confident you feel about your learning.

ESSENTIAL QUESTION	CONFIDENT	SOMEWHAT CONFIDENT	NEED MORE PRACTICE
1. How do human activities in forestry affect ecosystems, and how can we protect them?	☺	😐	☹
2. How do forces and Newton's Laws affect forestry machinery and moving logs safely?	☺	😐	☹
3. How does NZ forestry connect to global trade and the economy?	☺	😐	☹
4. How can I use data, measurement and statistics to make decisions in forestry?	☺	😐	☹
5. Why is precision in measurement important for safety, efficiency, and profit?	☺	😐	☹
6. How can what I've learned about forestry help me in the future?	☺	😐	☹

PART 2: MY EVIDENCE – SHOW WHAT I KNOW

Instructions: Pick one way you demonstrated your learning during this unit. Write or draw your answer.

Prompts:

- "In my project/model, I showed..."
- "When we measured timber/logs, I learned that..."
- "I used data to decide..."

My Evidence:

_____

_____

_____

_____

PART 3: MY "AHA!" MOMENTS

Instructions: Write or draw something new you learned that surprised or excited you.

- _____
- _____
- _____

PART 4: MY NEXT STEPS

Instructions: Think like a forester! What could you do next to improve your skills or understanding?

Prompts:

- "I want to practice measuring more accurately."
- "I want to learn more about sustainable forestry."
- "I want to understand global trade better."

My Next Steps:

_____

_____

_____

PART 5 (OPTIONAL FUN ADD-ON): DESIGN YOUR IDEAL FOREST

Instructions: Draw or make your ideal sustainable forest in Minecraft showing what you've learned about:

- ecosystems
- machinery and forces
- trade and supply chains
- measurement and data

Tip: Label one thing you are proud of learning in this unit!





SUCCESS CRITERIA

I can:

- reflect on my learning and identify strengths.
- use evidence to show what I know.
- connect my learning to real world forestry.
- identify next steps to improve my skills.
- communicate my ideas clearly using science vocabulary.

ASSESSMENT FOR LEARNING

Ngāhere o Aotearoa:

Growth, Guardianship & Green Futures

Year 9/10 Integrated Unit



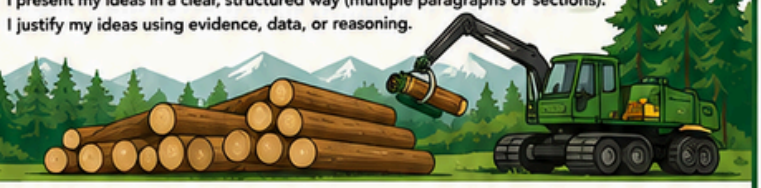
Your Name: _____

Date: _____

This rubric will help you understand what your work needs to include to be of a high standard.
Tick each skill as you demonstrate it in your work.

CRITERIA BEING ASSESSED	MY SKILLS Tick as you go!	EVIDENCE OF EXCELLENCE
1  **UNDERSTANDING ECOSYSTEMS & SUSTAINABILITY** (Science)	☐	• I can explain how forestry activities impact ecosystems (cause and effect). • I can compare native forest practices with plantation forestry (e.g., clear-felling vs selective logging) and their environmental impacts. • I can propose sustainable solutions (e.g., replanting, erosion control, biodiversity protection). • I can justify my ideas using scientific reasoning and evidence.
2  **APPLICATION OF FORCES & NEWTON'S LAWS** (Physics)	☐	• I can explain how forces act on objects in forestry (e.g., logs on slopes, cable systems). • I can apply Newton's Laws to real forestry situations. • I can compare different systems (e.g., ramp vs pulley) and explain efficiency. • I can explain why one system is safer or more effective than another. • I can use correct physics vocabulary (force, friction, gravity, load, acceleration).
3  **UNDERSTANDING FORESTRY IN THE GLOBAL ECONOMY** (Geography)	☐	• I can describe the journey of timber from forest to export market. • I can identify key trading partners (e.g., China, USA, Japan). • I can explain how local forestry decisions affect global trade. • I can compare economic vs environmental decisions (trade-offs). • I can explain how forestry contributes to New Zealand's economy and development.
4  **USE OF DATA & STATISTICAL REASONING** (Mathematics)	☐	• I can plan and investigate a statistical question related to forestry. • I can collect and organise multivariate data (categorical + numerical). • I can create and interpret graphs (e.g., scatter plots, bar graphs). • I can identify patterns and relationships between variables. • I can make evidence-based conclusions and recommendations.
5  **MEASUREMENT, PRECISION & ACCURACY** (Mathematics)	☐	• I can accurately measure length and diameter. • I can calculate volume (e.g., logs) correctly. • I understand that calculations are limited by measurement precision. • I can explain how small errors affect safety, profit, and planning. • I can justify which measurements are most reliable and why.
6  **IDENTIFYING CHALLENGES & MAKING DECISIONS** (Cross-curricular)	☐	• I can identify real challenges in forestry (e.g., terrain, weather, sustainability, cost). • I can explain how these challenges affect decision-making. • I can link challenges to limitations and risks. • I can propose practical solutions and justify them.
7  **EVALUATING ADVANTAGES & LIMITATIONS** (Social Sciences & Science)	☐	• I can explain advantages of forestry systems (efficiency, economic gain). • I can explain limitations (environmental impact, cost, safety risks). • I can use examples to support both advantages and limitations. • I can make balanced judgments using evidence.
8  **USE OF KEY VOCABULARY** (Across Learning Areas)	☐	• I use topic-specific vocabulary across science, geography and maths. • At least 75% of my key terms are subject-specific. • My vocabulary is used accurately and in context.
9  **FINAL PROJECT**	☐	• My work clearly connects science, geography, and mathematics. • I include at least three different contexts (ecosystems, forces, trade, or data). • I show understanding of the five key ideas: Ecosystems & Sustainability · Forces & Motion · Global Trade · Data & Statistics · Measurement & Precision • I include real-world examples or applications. • I present my ideas in a clear, structured way (multiple paragraphs or sections). • I justify my ideas using evidence, data, or reasoning.





SUCCESS CRITERIA

- I can understand and apply concepts across subjects.
- I use evidence and data to support my thinking.
- I make connections between learning and the real world.
- I communicate my ideas clearly using correct vocabulary.
- I reflect, improve, and take pride in my learning.

Ngāhere o Aotearoa – Subject and context glossary

Term	Student-friendly meaning
Ecosystem	A system in which living things interact with each other and with their physical environment.
	The living parts of an ecosystem, such as plants, animals, fungi and microorganisms.
Abiotic	The non-living parts of an ecosystem, such as water, soil, sunlight and temperature.
Biodiversity	The variety of living things found in an ecosystem.
Interdependence	When organisms or parts of a system depend on one another.
Habitat	The place where an organism lives and gets what it needs to survive.
Erosion	The movement of soil or rock by water, wind or gravity.
Sediment	Soil, sand and other material that is moved and deposited by water or wind.
Runoff	Water that flows across the land rather than soaking into the ground.
Catchment	An area of land where rainfall drains into the same stream, river, lake or other body of water.
Riparian zone	The area of land alongside a stream, river or other waterway.
Sustainability	Meeting present needs while protecting resources and systems so they can continue into the future.
Environmental impact	A change to the environment caused by an activity or event.
Restoration	Helping a damaged or changed ecosystem recover.
Conservation	Protecting and carefully managing species, habitats and natural resources.

Ngāhere o Aotearoa – Subject and Context Glossary

TERM	STUDENT-FRIENDLY MEANING
Te ao Māori	A Māori worldview encompassing relationships, knowledge, values and ways of understanding the world.
Whakapapa	Relationships and connections linking people, living things, places and generations.
Kaitiakitanga	Responsibilities and practices associated with caring for and sustaining people, places and te taiao.
Mauri	The life force or vitality associated with people, living things and the natural world.
Whenua	Land; a concept carrying relationships, identity and connections as well as its physical meaning.
Wai	Water and waterways.
Ngahere	Forest or bush.
Te taiao	The natural world and environment.
Mana whenua	Iwi or hapū who hold customary authority and relationships with a particular area.
Mātauranga Māori	Māori knowledge developed through generations of observation, experience, relationships and practice.
Intergenerational responsibility	Considering how decisions made today may affect people and environments in the future.

Ngāhere o Aotearoa – Subject and context glossary

Term	Student-friendly meaning
Force	A push or pull that can change an object's motion. Force is measured in newtons (N).
Gravity	The force that attracts objects towards Earth.
Friction	A force that resists movement when surfaces move against each other.
Mass	The amount of matter in an object, usually measured in kilograms.
Acceleration	A change in an object's speed or direction over time.
Tension	A pulling force transmitted through a rope, cable or similar material.
Load	An object or weight being supported, lifted or moved.
Gradient	The steepness of a slope.
Newton's Laws of Motion	Three scientific laws that explain how forces affect the movement of objects.
Mechanical advantage	When a machine or system makes it easier to move or lift a load by changing the size or direction of the force required.
Pulley	A wheel and rope or cable system used to change the direction of a force or make a load easier to move.
Force diagram	A diagram using arrows to show the forces acting on an object.

Term	Student-friendly meaning
Variable	Something that can take different values or belong to different categories in a dataset.
Categorical variable	Data that describes groups or categories, such as soil type.
Numerical variable	Data represented by numbers, such as tree height or age.
Multivariate data	Data involving three or more variables.
Statistical question	A question that can be answered using data and expects variation in the results.
Dataset	A collection of information or measurements gathered for analysis.
Scatter plot	A graph showing the relationship between two numerical variables.
Pattern	Something noticeable or repeated within data.
Relationship	A connection between two or more variables.
Evidence	Information or data used to support an explanation, conclusion or decision.
Accuracy	How close a measurement is to the accepted or actual value.
Precision	How consistent repeated measurements are with one another.
Uncertainty	The amount of doubt associated with a measurement or conclusion.
Volume	The amount of three-dimensional space an object occupies.
Sample	A smaller group studied to provide information about a larger population.
Limitation	Something about an investigation or evidence that restricts what we can confidently conclude.

Term	Student-friendly meaning
Economy	The system through which goods and services are produced, bought, sold and used.
Primary industry	An industry that obtains resources from the natural environment, such as forestry, farming or fishing.
Export	A good or service sold from New Zealand to another country.
Import	A good or service brought into New Zealand from another country.
Global economy	The interconnected economic activities and trade relationships between countries.
Trade	The buying and selling of goods and services.
Trade partner	A country with which New Zealand buys or sells goods and services.
Supply chain	The connected stages involved in producing, transporting and selling a product.
Interdependence	When people, businesses, places or countries rely on one another.
Economic development	Changes that increase economic activity and can affect people's opportunities, incomes and living standards.
Stakeholder	A person or group that is affected by, interested in or can influence a decision.
Perspective	A particular way of seeing or understanding an issue.
Trade-off	A situation where gaining one benefit may mean accepting a cost or giving up another benefit.
Short-term consequence	An effect that happens relatively soon after a decision or action.
Long-term consequence	An effect that develops or continues over a longer period.
Decision-making criteria	Standards used to compare options and decide which best meets a purpose.

Term	Student-friendly meaning
Plantation forest	A forest deliberately planted and managed, usually for timber or other forest products.
Radiata pine	The most widely grown commercial plantation tree species in New Zealand.
Silviculture	The growing and management of trees to achieve particular forest outcomes.
Harvesting	Cutting and extracting trees from a forest for processing or sale.
Selective harvesting	Removing selected trees rather than harvesting all trees from an area at the same time.
Clear-felling	Harvesting most or all commercial trees within a defined area at approximately the same time.
Replanting	Establishing another crop of trees after harvesting.
Forestry residue	Branches, tops and other woody material remaining after forestry operations.
Log	A section of a tree stem that has been cut for transport, processing or sale.
Landing / skid site	A prepared area where logs are brought together, processed, sorted or loaded onto trucks.
Cable logging	A harvesting system that uses cables to move logs, often on steep terrain.
Yarder / hauler	Machinery that uses a cable system to extract logs from difficult or steep terrain.
Forest road	A road constructed to provide access for forest establishment, management and harvesting.
Culvert	A pipe or structure that allows water to pass underneath a road or track.
Riparian planting	Planting vegetation beside waterways to help protect banks, habitat and water quality.
Erosion control	Actions taken to reduce the movement or loss of soil.
Sediment control	Actions used to reduce the amount of eroded soil reaching waterways.
Log truck	A specialised vehicle designed to transport logs.
Wood processing	Turning logs into products such as timber, panels, pulp, paper or engineered wood.
Port	A place where goods are transferred between land transport and ships.
Marshalling	Organising, storing and preparing logs or other cargo at a port before loading.

Term	Student-friendly meaning
Claim	A statement or conclusion that you think is supported by evidence.
Evidence	Information, observations, measurements or data used to support a claim.
Reasoning	The explanation connecting your evidence to your claim.
Criteria	Standards used to judge or compare possible options.
Constraint	Something that limits the possible solutions to a problem.
Risk	The possibility that an action could lead to an unwanted outcome.
Benefit	A positive outcome that could result from a decision.
Consequence	Something that happens as a result of an action or decision.
Systems thinking	Looking at how different parts of a system connect and influence one another.
Evaluate	To judge something using evidence and agreed criteria.
Justify	To give evidence and reasoning showing why a decision or conclusion is appropriate.
Recommendation	A suggested course of action based on evidence and reasoning.
Solution	A response designed to address a problem or challenge.
Trade-off	Accepting less of one desirable outcome in order to gain another.
Transfer	Using knowledge or skills learned in one situation to solve a different or unfamiliar problem.

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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.