**NZQA**

**Approved**

Achievement standard: 90953 Version 3

Standard title: Demonstrate understanding of carbon cycling

Level: 1

Credits: 4

Resource title: The carbon cycle and forestry

Resource reference: Science VP-1.14 v2

Vocational pathway: Primary Industries

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| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number A-A-02-2015-90953-02-7304 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.  Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

Achievement standard: 90953

Standard title: Demonstrate understanding of carbon cycling

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Resource title: The carbon cycle and forestry

Resource reference: Science VP-1.14 v2

Vocational pathway: Primary Industries

Learner instructions

# Introduction

This assessment activity requires you to demonstrate your understanding of carbon cycling as it relates to the forestry industry.

You are going to be assessed on how you demonstrate comprehensive understanding by thoroughly explaining the links between the addition, removal and storage of carbon in a forestry context.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

Working in the forestry sector, you are responsible for providing a presentation on carbon cycling to forestry contractors and workers. Your presentation should include a description of the carbon cycle and addition, removal and storage of carbon.

## Gather Information

Collect information from various sources related to the carbon cycle – to explain thoroughly the links between the addition, removal and storage of carbon using information, visual representations and data.

Information sources could include images, diagrams and data from a range of sources such as field data and observations, laboratory investigations, course notes, books, atlases, magazines, Google Earth and other websites.

## Prepare and present your findings

Process the information you have gathered and create or select relevant illustrations and diagrams.

Your presentation to the forestry contractors and workers will show your comprehensive understanding of carbon cycling.

Demonstration of comprehensive understanding could include:

* the results of any experiments
* data, information, or images gathered from field work, trips or demonstrations
* explaining how the addition, removal, and storage of carbon relate to the carbon cycle in the forestry industry
* elaborating about the length of time the carbon remains in the cycle stages, explaining thoroughly how the addition, removal and storage stages of the cycle are linked or interconnected.

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to demonstrate their comprehensive understanding of carbon cycling, with particular reference to the forestry industry. Learners will thoroughly explain the links between the addition, removal and storage of carbon in carbon cycling.

# Conditions

Provide opportunities for learners to collect scientific information about the forestry area that has been chosen.

Select research contexts that are relevant to the learners, or help them select appropriate activities.

Learners may work together to gather information but will need to demonstrate individual competence in meeting the criteria of the standard.

# Resource requirements

Provide access to appropriate:

* recording equipment
* measurement equipment
* computers
* libraries
* information technologies
* forest mensuration data (tree sizes, growth rates, stocking rate)
* carbon calculations.

# Additional information

None.

## Other possible contexts for this vocational pathway:

* Carbon cycling in horticulture/orchards.
* Growing grapes for winemaking.
* West Coast forests and coal: a study in carbon cycling.

# Assessment schedule: Science 90953 – The carbon cycle and forestry

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner demonstrates understanding of carbon cycling by:   * describing the addition, removal and storage of carbon using information, visual representations and data * providing at least two examples from the area of forestry that describe the addition (respiration, excretion, decay), removal (photosynthesis, dissolving in water), and storage (short term, e.g. by forest, long term, e.g. by sediments, coal oil) using information, visual representations and data * arranging and connecting these examples in valid ways to show carbon cycling   For example:  *Coal shows long-term storage of carbon formed by the compression of ancient plant material.* *When it is burned, carbon is released into the atmosphere as carbon dioxide. Carbon dioxide is used by plants to produce food.*  The above expected learner responses are indicative only and relate to just part of what is required. | The learner demonstrates in-depth understanding of carbon cycling by:   * explaining the addition, removal and storage of carbon using information, visual representations and data * identifying the links between the addition, removal and storage of carbon * presenting at least two complete examples from the area of forestry that explain the addition, removal and storage processes of the carbon cycle using information, visual representations and data * arranging and connecting these examples to explain carbon cycling   For example:  *Coal shows long-term storage of carbon because it was formed by the compression of ancient plant material. When it is burned, carbon combines with oxygen to produce carbon dioxide, which is released into the atmosphere. Carbon dioxide from the atmosphere is absorbed by plants and used to produce food or other carbon-rich compounds.*  The above expected learner responses are indicative only and relate to just part of what is required. | The learner demonstrates comprehensive understanding of carbon cycling by:   * explaining thoroughly the links between the addition, removal and storage of carbon using information, visual representations and data * explaining thoroughly the links between the addition, removal and storage of carbon * presenting at least two complete examples from the area of forestry that thoroughly explain the addition, removal, and storage processes of the carbon cycle using information, visual representations and data. This includes how long carbon remains in some stages of the cycle * arranging and connecting these examples to thoroughly explain carbon cycling   For example:  *Coal shows long-term storage of carbon because it was formed by the compression of ancient plant material. Ancient plants would have originally got carbon dioxide from the atmosphere. When coal is burned, carbon combines with oxygen to produce carbon dioxide, which is released into the atmosphere. Carbon dioxide from the atmosphere is absorbed by plants and used to produce food. It also gets absorbed by the oceans and can become part of plankton.*  *Over geologic time coal has stored a lot of carbon up in geological beds. Since carbon is a fuel, humans have burned a lot of coal and hence released a lot of this long-term carbon storage. This release of carbon dioxide is raising the levels of carbon dioxide in the atmosphere at a faster rate than has ever happened in the Earth’s geological history.*  The above expected learner responses are indicative only and relate to just part of what is required. |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.