**NZQA**

**Approved**

Achievement standard: 90951 Version 3

Standard title: Investigate the biological impact of an event on a New Zealand ecosystem

Level: 1

Credits: 4

Resource title: Roundup in the forest!

Resource reference: Science VP-1.12 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-02-2015-90951-02-7301 |
| 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: 90951

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Learner instructions

# Introduction

This assessment activity requires you to investigate the biological impact of a herbicide on a New Zealand ecosystem.

You are going to be assessed on how comprehensively you investigate the biological impact of a herbicide on a New Zealand ecosystem.

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

Investigate the impact of the blanket aerial application of the herbicide glyphosateon a forest ecosystem, as a land preparation for plantation forestry.

Choose two different areas of land being prepared for plantation forestry, one before the application of glyphosate, and one after the application of glyphosate:

* analyse the data
* identify changes in the forest ecosystem, and how these changes might affect the organisms present
* write a report about the human impact on this ecosystem.

The task involves three parts: collecting field data, collating and processing the data and then drawing conclusions based on it, and writing a report.

## Collect field data

Collect field data from the two areas prepared for forest plantation. Both areas will have some features in common, but one has been affected by a human action, as it has recently had the blanket application of the herbicide glyphosate.

Before you start collecting the data, draw a sketch map of the area, and create a data-recording sheet.

## Collate and analyse the data

Use the equipment provided to collect data on the ecosystem.

Analyse all the data and information you collected from the two areas of the forest plantation ecosystem.

Annotate any diagrams and photographs with supplementary notes.

Use your findings and observations to identify differences (changes) in the environment between the two areas, and link them to the use of glyphosate as a herbicide. This will help you to draw conclusions in your report.

## Write your report

Write a report on the impact of the blanket application of glyphosateon the ecological characteristics of organisms in the forest plantation ecosystem.

Describe your observations and findings, identify differences in the ecosystem of the two areas, and describe how the differences might affect the organisms within the ecosystem.

Discuss the impact of the environmental factor you measured on the ecological characteristic of the two areas, and the implications for the ecosystem as a whole.

# Resources

Useful websites:

<http://www.scionresearch.com/general/publications/science-publications/bulletins>

<http://doc.govt.nz/publications/>

<http://www.pce.parliament.nz/publications/all-publications/evaluating-the-use-of-1080-predators-poisons-and-silent-forests>

Useful article:

*Environmental effects of planted forests in New Zealand: The implications of continued afforestation of pasture*, FRI Bulletin No. 198, J. P. Maclaren, 1996.

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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 investigate, comprehensively, the impact of the blanket aerial application of the herbicide glyphosate as land is prepared for plantation forestry.

Learners will collect data from two areas of land being prepared:

* one area should show significant changes resulting from the human impact of the aerial application of the herbicide glyphosate
* the second area should be unaffected to enable comparison between the two, and consideration of the effect of the application on the organisms within the ecosystem.

The choice of sites is important. Learners need to be able to discuss meaningful changes and effects of this human impact on the ecosystem.

# Conditions

Learners will carry out the fieldwork in groups, with each learner recording their own data, using data sheets to record their fieldwork. The final work will be individually assessed.

Decide on the format of the final presentation. You may wish to take learner preferences into account when deciding on the format.

Provide instructions for making a sketch map of each area, for example the map could include an approximate scale and any obvious features such as shading, roads, walkways etc. Add instructions about how you want the learners to collect the data, for example data sheets to record their fieldwork.

# Resource requirements

Provide learners with a means of correctly identifying the types of organisms (plants and animals) they are likely to find, or build the identification process into prior teaching and learning.

Provide access to resources that will help learners to discuss the distribution of the organisms they find, with reference to environmental factors and the biology of the organisms. For example: [http://pmep.cce.cornell.edu/profiles/extoxnet/dienochlor-glyphosate](http://pmep.cce.cornell.edu/profiles/extoxnet/dienochlor-glyphosate/).

Learners will need access to suitable equipment for sampling in the field, such as: identification sheets or keys, quadrats of varying sizes, 1 m rulers and 10 m tape measures, transect lines, point samplers, polystyrene blocks, magnifying glasses, equipment for measuring abiotic factors (e.g. pH paper, thermometers, data loggers, lux meters).

# Additional information

Procedures outlined in *Safety in Science: a Guidance Manual for New Zealand Schools*, Learning Media, Ministry of Education, 2000, should be followed.

## Other possible contexts for this vocational pathway

Another human action could be investigated, for example:

* the blanket application of fertiliser (e.g. urea or superphosphate) or lime to a soil on agriculture or plantation forestry. How this impacts on nutrient availability to plants, soil chemistry, nutrient cycles, the water cycle, energy flow, diversity of organisms, key species. The impact of runoff on downstream ecosystems could also be considered
* the aerial application of 1080 poison over indigenous forests to control introduced pests like possums. How this impacts on ecosystems, diversity of organisms, nutrient cycles, interrelationships between organisms (e.g. predation, parasitism and mutualism), nutrient cycles, the water cycle. Toxicity (to plants, insects and mammals) and biodegradability could also be considered.

# Assessment schedule: Science 90951 – Roundup in the forest!

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner investigates the biological impact of a herbicide on the New Zealand ecosystem of a forest plantation by:* describing observations or findings about two areas of a forestry ecosystem, one which has been sprayed with glyphosate, and one which has not
* using these findings to identify a change in the makeup of the ecosystem related to the event under investigation

For example, the learner describes:*The area that was not sprayed with glyphosate had* [name of the organisms found – plants and animals] *in abundance; the* [name of the plant species] *in this area had densities of* [specify the densities in numbers/m2].*In comparison, the land prepared for plantation forests that was sprayed with glyphosate only had* [name of the organisms found – plants and animals]*; the* [name of the plant species] *in this area had densities of* [specify the densities in numbers/m2].*There were no plants growing along the paths and roads. In places where plants are able to grow: 1 metre in from the road in the unsprayed area, there were less* [name of the plant species] *than* [name of the plant species].*The ground in the sprayed area was also dryer; the spraying changed the type and number of plants that are growing in that area.**The above expected learner responses are indicative only and relate to just part of what is required.* | The learner investigates, in-depth, the biological impact of a herbicide on the New Zealand ecosystem of a forest plantation by:* describing observations or findings about the blanket aerial application of the herbicide glyphosate in one area of a forestry ecosystem, and comparing it to an unaltered forest ecosystem
* using these findings to explain how the event has caused a change in the forest ecosystem

For example, the learner explains:*Glyphosate is a broad-spectrum systemic herbicide used to kill weeds, especially annual broadleaf weeds and grasses known to compete with commercial crops and young trees. This is why there were more* [name of the organisms found] *in the area (land not prepared for plantation forests) that had not been sprayed.**There were no plants growing along the paths and roads and the ground is hard and compact, making it more difficult for the roots to grow in the soil.**The above expected learner responses are indicative only and relate to just part of what is required.* | The learner investigates, comprehensively, the biological impact of a herbicide on the New Zealand ecosystem of a forest plantation by:* discussing observations or findings about the blanket aerial application of the herbicide glyphosate in one area of a forestry ecosystem, and comparing it to an unaltered forest ecosystem
* using these findings and biological ideas to make significant causal links between the event and changes in the forest ecosystem
* discussing the impact on organisms, and the implications for the ecosystem as a whole, now and in the future

For example, the learner discusses:*Rye grass and clover are plants that have shallow rooting systems and more delicate leaf structures that do not tolerate low water levels. They are therefore more easily killed by glyphosate as a result. Plantain is a plant that has a deeper rooting structure so that it can grow through the compacted ground to reach more water. While plantain is more resistant to being killed by glyphosate, as long as the weather permits and the strength is correct, it will eventually also die. This makes glyphosate an effective spray to use to prepare land for plantation forests.**Paspalum and groundsel were well established plants in the unsprayed area, and appear to be spreading into the bare areas along by the path as they are fast growing weeds, and seem to be out-competing the rye grass, clover, and even the plantain. If paspalum is allowed to spread onto land that has been prepared, it will be hard to eradicate. More herbicide will need to be used.**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.