**NZQA**

**Approved**

Achievement standard: 91153 Version 2

Standard title: Carry out a practical investigation in a biology context, with supervision

Level: 2

Credits: 4

Resource title: Stream health

Resource reference: Biology VP-2.1 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-02-2015-91153-02-8141 |
| 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

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Learner instructions

# Introduction

This assessment activity requires you to carry out a practical investigation in a biology context, with supervision, of the presence (or absence) of a pattern or relationship between organisms, within a stream community on a farm.

You are going to be assessed on how comprehensively you carry out a practical investigation of the presence (or absence) of a pattern or relationship between organisms, within a stream community on a farm. In your report on your investigation you need to show that you can write a hypothesis, use a method that describes a valid collection of data, process and interpret this data, reach a valid conclusion and discuss the biological ideas relating to the investigation based on your findings and those from other source(s). You also need to justify the choices you made during your investigation.

You have access to your portfolio of biological ideas and concepts learned during the teaching of the topics as you write your report.

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

In New Zealand there is increasing awareness of the role farming practices play in determining the health of our waterways. The aspect you will investigate is the impact of one farming practice by comparing organisms found in a freshwater stream in a farm which is surrounded by a planted riparian strip, with a stream that flows through fenced grassland.

You will collect information from these two different stream communities and then identify the similarities and differences in the diversity of the macro-invertebrates shown in the two.

Diversity means the numbers and types of organisms in the community.

Macro-invertebrates are animals that do not have backbones and are visible to the naked eye.

## Select a focus and plan your investigation

Select two sites of the farm stream community to investigate based on your knowledge of the stream area, or from resources about the habitat and macro-invertebrates located at the site provided by your assessor/educator.

Complete your draft plan, and submit this to your assessor/educator for feedback. It should include:

* a purpose for your investigation, written as a hypothesis linked to the aspect of the stream community you will investigate
* a detailed step by step method on how to collect your data considering:
  + the range of samples to be collected
  + how data will be collected for each sample
  + how samples will be chosen or sample size decided
  + how other variables and factors that could have a significant impact on the investigation will be measured or observed
  + the equipment needed
  + how the results will be checked to see if they are accurate, valid and reliable.

## Collect and record your data

Based on your individual plans, your assessor/educator will put you into groups to collect your field data, and will provide appropriate equipment for your investigation.

Discuss your individual plans, and decide on a shared plan to carry out in the field.

Write and submit your group plan.

Carry out your plan in your assigned group, ensuring that you do the following:

* collect and record your own field data
* record the field data and observation relevant to your investigation in an appropriate way
* amend your method as you carry out your investigation. Make sure you record all of these changes.

## Process your data and report your findings

Process your field data to produce results that can be compared directly with each other to enable the presence (or absence) of a trend or pattern to be determined, and compared directly, with other sources of information provided by your assessor/educator.

Graph the processed data in a way that allows you to interpret the trend in the data.

Use the processed field data, observations, and measurements you recorded, your portfolio of biological ideas and concepts learnt during teaching, and information provided by your assessor/educator, to write a biological report on your findings that includes:

* a statement of the purpose of your investigation written as a hypothesis, linked to the aspect of the stream community you investigated
* a detailed account of the final step by step sampling method you used
* a profile diagram or site map of the sampling area you investigated that would allow another person to locate it
* your field data on the distribution of the macro-invertebrates sampled, observations, and measurements of environmental factors. Attach this as an appendix at the end of your report
* your processed field data presented in a table and graph appropriate to the type of data collected
* a description of the presence (or absence) of a pattern or relationship in the diversity of macro-invertebrates, based on the processed data relevant to your hypothesis. This forms your conclusion
* an explanation of the conclusion in terms of the biological ideas relevant to your investigation
* a discussion of the presence (or absence) of a pattern or relationship, using the biological ideas relating to your investigation, based on your findings and those from the other sources provided
* an evaluation of the investigation. This could consider reliability of the data or the validity of the method (i.e. how sources of error, limitations, or bias were minimised or overcome).

# Resources

Some useful websites include:

National Institute of Water and Atmospheric Research (NIWA): <http://www.niwa.co.nz/>.

Stream health monitoring and assessment kit: <http://www.niwa.co.nz/our-science/freshwater/tools/shmak>. NIWA also provides publications about riparian strips, waterway management, and stream health monitoring.

NZ Landcare Trust: <http://www.landcare.org.nz/>. This website has fresh water invertebrates’ guide (identification and information about different species) and information regarding stream, monitoring, health/quality etc.

Ministry for Primary Industries (MPI): <http://www.mpi.govt.nz/>.

Ministry for the Environment (MFE): <http://www.mfe.govt.nz/index.html>.

Vocational Pathway Assessment Resource

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Vocational pathway: Primary Industries

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 carry out a comprehensive practical investigation, with supervision, of the presence (or absence) of a community pattern or relationship, by comparing the diversity of macro-invertebrates in a stream found on farmland surrounded by a planted riparian strip, with a stream that flows through fenced grassland. Learners must show that they can plan their investigation, process and interpret information and field data, justify choices made, and write a biological report.

# Conditions

Each learner will develop their own plan, but the final method may be carried out as part of a group. Learners must interpret their own findings.

Learners will produce an individual written report of their investigation, but may work in groups to collect their data based on similar investigations.

Decide on the format of the final report.

# Resource requirements

The assessor/educator will need to provide learners with:

* findings from other source(s) of information for learners to compare their investigation findings to. This should consist of two to three sources of relevant information, and can come from historical findings, scientific reports, published textbooks, or previous learner work. All learners will be provided with copies of the same information
* access to the internet to research the location, and its organisms, prior to the field trip
* field equipment as appropriate for the type of investigation, for example quadrats of varying size, measuring tapes, GPS equipment, maps, nets or sieves, white trays, buckets, sample containers, magnifiers, stream macro-invertebrate identification sheets, equipment for measuring abiotic factors (water flow, water clarity measuring tubes, conductivity meter, pH paper, thermometer, data loggers).

# Additional information

This assessment activity involves fieldwork, so health and safety requirements must be considered and followed. In addition, permission should be obtained from the owner if access is required to private land, and their health and safety requirements will also need to be followed.

The investigation is carried out with supervision. This means that the assessor/educator provides guidelines such as the context, task instructions that specify the requirements for a comprehensive investigation, and broad experimental conditions such as the availability of equipment.

## Other possible contexts for this vocational pathway

Plant and/or macro- invertebrate diversity and zonation studies could be investigated in communities related to other primary industries, for example aquaculture and fishing, forestry, horticulture, green keeping, and turf management.

Other possible aspects to investigate could be comparing the impact of land use for one farming practice in:

* the same stream in farm land and native bush or pine forests
* an urban stream/farm stream

# Assessment schedule: Biology 91153 – Stream health

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner carries out a practical investigation of the presence (or absence) of a pattern or relationship between organisms within a stream community on a farm, with supervision, by:   * developing a statement of purpose, written as a hypothesis linked to the aspect of the stream community being investigated   For example:  *Hypothesis: There is a higher macro-invertebrate diversity in a stream bed that is surrounded by a planted riparian strip compared with a stream that flows through fenced grassland.*   * using a final method that includes descriptions of the data that will be collected, the range of data and/or samples, and consideration of at least two other key factors * collecting, recording, and processing data relevant to the hypothesis   For example:  The field data records species names and numbers at each sampling point.   * interpreting and reporting on the findings with a conclusion based on the processed data in relation to the hypothesis of the investigation * identifying and including relevant findings from another source   For example:  *Streams that are surrounded by a planted riparian strip have greater macro-invertebrate diversity* [ref to another source].   * the processed data is tabulated or graphed in a way that requires reference to the collection method to be understood, e.g. as a table or graph, or the calculation of averages relevant to the hypothesis, and may include minor processing errors * the interpretation of the processed data is a fair representation of the data, and includes a description of the presence (or absence) of a distribution pattern or relationship. This acts as the conclusion   For example:  *There are three more macro-invertebrate species found in the stream bed that is surrounded by a planted riparian strip compared with a stream that flows through fenced grassland. These are mayflies, stoneflies and caddis flies.*  *The above expected learner responses are indicative only and relate to just part of what is required.* | The learner carries out an in-depth practical investigation of the presence (or absence) of a pattern or relationship between organisms within a stream community on a farm, with supervision, by:   * developing a statement of purpose, written as a hypothesis linked to the aspect of the stream community being investigated   For example:  *Hypothesis: There is a higher macro-invertebrate diversity in a stream bed that is surrounded by a planted riparian strip compared with a stream that flows through fenced grassland.*   * using a final method that includes descriptions of the valid collection of data, and how most factors such as sampling bias and sources of errors have been considered * accurately collecting, recording, and processing data to enable a trend or pattern (or absence) to be determined   For example:  The field data accurately records site information, orientation, species names and numbers at each sampling point, in a form that allows it to be processed later, e.g. with units and headings.   * interpreting and reporting on the findings and reaching a valid conclusion based on the processed data in relation to the hypothesis of the investigation * discussing the biological ideas relating to the investigation based on the findings and those from other sources   For example:  *Our data shows there were three more species of macro-invertebrates in the stream bed that is surrounded by a planted riparian strip. Our research showed … [ref to other source](…); many macro-invertebrates feed on organic material from the stream bed [ref to other source]. The more diverse the plant life in a community, the more animals it can support [ref to other source]. Such streams are often well shaded due to bush cover, and protecting the streamside vegetation may be the best stream management tactic [ref to other source].*   * the processed data is tabulated or graphed in a systematic way that does not require reference to the collection method to be understood * the interpretation of the processed data is a fair representation of the data, and includes a valid description of the presence (or absence) of a distribution pattern or relationship. This acts as the conclusion   For example:  *The number of macro-invertebrate species found in the stream bed surrounded by a planted riparian strip was twice that compared with the stream that flows through grassland with no planting.*  *The above expected learner responses are indicative only and relate to just part of what is required.* | The learner carries out a comprehensive practical investigation of the presence (or absence) of a pattern or relationship between organisms within a stream community, with supervision, by:   * developing a statement of purpose, written as a hypothesis linked to the aspect of the stream community being investigated   For example:  *Hypothesis: There is a higher macro-invertebrate diversity in a stream bed that is surrounded by a planted riparian strip compared with a stream that flows through fenced grassland.*   * using a final method that includes descriptions of the valid collection of data, and how most factors such as sampling bias and sources of errors have been considered * accurately collecting, recording, and processing data to enable a trend or pattern (presence or absence) to be determined   For example:  The field data accurately records site information, orientation, species names and numbers at each sampling point, in a form that allows it to be processed later, e.g. with units and headings.   * interpreting and reporting on the findings and reaching a valid conclusion based on the processed data in relation to the hypothesis of the investigation * discussing the biological ideas relating to the investigation based on the findings and those from other sources   For example:  *Our data shows there were three more species of macro-invertebrates in the stream bed that is surrounded by a planted riparian strip. Our research showed … [ref to other source](…); many macro-invertebrates feed on organic material from the stream bed [ref to other source]. The more diverse the plant life in a community, the more animals it can support [ref to other source]. Such streams are often well shaded due to bush cover, and protecting the streamside vegetation may be the best stream management tactic [ref to other source].*   * the processed data is tabulated or graphed in a systematic way that does not require reference to the collection method to be understood * the interpretation of the processed data is a fair representation of the data, and includes a valid description of the presence (or absence) of a distribution pattern or relationship * explaining the conclusion in terms of the biology ideas relevant to the investigation   For example:  *Our data shows there were ... Our research showed that … [ref to other source]; therefore it is no surprise that there were ... the areas … had less diversity … therefore... this led to … The stream that flows through fenced grassland had less diversity and therefore provided a less diverse source of food for the macro-invertebrates. This led to less species diversity in macro-invertebrates.*   * the learner justifies the choices made during the investigation by evaluating the validity of the method or reliability of the data   For example:  *I feel our data is reliable as we had a large sample size in both areas, and we used consistent methods of counting organisms. We also shared data with the other group that was carrying out the same investigation, but in different stream bed areas surrounded by planted riparian strip and grassland. By pooling and averaging the data we got a more reliable pattern showing the diversity of macro-invertebrates in both areas at …*  *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.