



The Scientific Collection at the Orange Agricultural Institute

Teacher's Guide

In this video – synopsis

6 mins 36 secs

This video is an overview of the Scientific Collections of the NSW Department of Primary Industries; why we have them and why they are so important. The collections include plant and insect pests and diseases, as well as live cultures.

Careers highlighted: entomologist, plant pathologist and scientific curator.

We recommend that teachers watch these videos before showing them to students to assess their suitability. There are some scientific terms used in the videos that your students may not be familiar with. We have provided some definitions in this document for teachers who would like to use the videos as an opportunity to develop the scientific literacy of their students.

Other videos in this series include:

- Let's talk about aphids
- Preserving the Scientific Collection of the NSW Department of Primary Industries
- Biosecurity monitoring and surveillance with the NSW Department of Primary Industries

Curriculum links

This video can support students understanding of the following outcomes:

Stage 3

Science and Technology

A student:

ST3-10LW - describes how structural features and other adaptations of living things help them to survive in their environment

ST3-11LW - describes some physical conditions of the environment and how these affect the growth and survival of living things

Stage 4

Science and Technology

A student:

SC4-14LW relates the structure and function of living things to their classification, survival and reproduction

SC4-15LW explains how new biological evidence changes people's understanding of the world

Geography

A student:

GE4-5 discusses management of places and environments for their sustainability

GE4-3 explains how interactions and connections between people, places and environments result in change

Stage 5

Geography

A student:

GE5-3 analyses the effect of interactions and connections between people, places and environments

GE5-5 assesses management strategies for places and environments for their sustainability

Vocabulary used:

Unless otherwise stated definitions are from the Macquarie Dictionary online

(<https://www.macquariedictionary.com.au/>)

Note: Where (biology) appears in brackets before a definition, this indicates that there are other definitions (usually in different disciplines) but that this definition relates to the way the term is used in this video.

Agriculture (noun) the cultivation of land, including crop-raising, forestry, stock-raising, etc.; farming

Biodiversity (noun) the variety of species of plants, animals and microorganisms, their genes, and the ecosystems they comprise, often considered in relation to a particular area: threats to coastal biodiversity

Culture (Biology) a. the cultivation of microorganisms, as bacteria, or of tissues, for scientific study, medicinal use, etc

b. the product or growth resulting from such cultivation

Diagnostics	(noun) the science of diagnosis (the process of determining, by examination of the patient, the nature and identity of a diseased condition.)
DNA	(noun) 1. one of a class of large molecules which are found in the nuclei of cells and in viruses and which are responsible for the transference of genetic characteristics, usually consisting of two interwoven helical chains of polynucleotides 2. the basic structure: in the DNA of our relationship. [d(eoxyribo)n(ucleic) a(cid)]
Evolve	(verb) (Biology) to change through descending generations, usually to a more highly organised condition
Forestry	(noun) the science and practice of planting and taking care of forests
Horticulture	(noun) commercial cultivation of fruit, vegetables, and flowers, including berries, grapes, vines and nuts
Hosts	(noun) an animal or plant from which a parasite obtains nutrition
Impacts	(noun) noticeable effects
Infect	(verb) to affect with disease
Invertebrates	(adjective) (Zoology) not vertebrate; without a backbone
NSW DPI	New South Wales Department of Primary Industries
Occurrences	(noun) something that occurs; an event or incident
Specimen	(noun) a part or an individual taken as exemplifying a whole mass or number; a typical animal, plant, mineral, part, etc.
Species	(noun) 1. a group of individuals having some common characteristics or qualities; distinct sort or kind. 2. the basic category of biological classification, intended to designate a single kind of animal or plant, any variations existing among the individuals being regarded as not affecting the essential sameness which distinguishes them from all other organisms within the category.
Type	(Biology) an individual or collection of individuals of a species stored in a museum or herbarium and used as a reference standard for that species.
Ungulates	(noun) a hoofed mammal
Vector	(Biology) an insect or other organism transmitting germs or other agents of disease
Vertebrate	(noun) 1. a vertebrate animal. (adjective) 2. having vertebrae; having a backbone or spinal column.

3. belonging or relating to the Vertebrata, a subphylum of the phylum Chordata, all members of which have backbones.

Voucher (in biology) a preserved specimen of an identified taxon deposited in a permanent and accessible storage facility, the voucher serves as the supporting material for published studies of the taxon and ensures that the science is repeatable. Vouchers are crucial in authenticating the taxonomy of an organism, as a tool for identifying localities of the taxon, and for additional taxonomic, genetic, ecological, and/or environmental research. (from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4103463/>)

Transcript of Video

Text: NSW Department of Primary Industries, Scientific Collections at Orange Agricultural Institute.

Peter: Hi I'm Peter Gillespie, I'm the Curator of Collections here at Orange Agricultural Institute in Orange, we're part of NSW DPI and you're standing in our collection halls here with half a million insects ...

Ainsley: ... And me! I'm Ainsley Seago I'm the Technical Manager of the insect collection and I identify beetles and help Peter take care of the collection . We also do surveillance and research and DNA based diagnostics as well as morphological work...

Peter: ... Absolutely.

These collections were set up to assist agriculture. It's evolved to be something far more important in terms of how we examine pests and disease relationships and how that impacts on trade. It's a process that's constantly going on behind the scenes.

This collection's important - while there are far larger biodiversity collections available - this collection's important because we hold important information on what the actual pest and disease was doing at the time. Meaning we understand that this pest was chewing this particular plant or this disease was infecting that plant and that's important. If people in Queensland have a particular disease we don't want we may not necessarily want to buy their produce until they can assure us that they're free of that and these collections give us that information. We have that documented. What we do is capture those new occurrences of pests and what they're feeding on and the sorts of impacts they might ultimately lead to in terms of trade and income. And that of course stretches not only within Australia but beyond Australian borders to international.

Ainsley: Some of this is human health related as well for example, like these are *Ixodes holocyclus* which I believe is our buddy the paralysis tick. Here's one collected 'on human' at Lovett Bay 1987 ... from ear of *Rattus rattus* 1931, EH Zeck - our illustrator here ran down a long tailed rat and from its ear he pulled a specimen of a paralysis tick at Ryde New South Wales and he carefully recorded the data label right here for

eternity ... Orange NSW 1968 *Ixodes holocyclus* from cats ears ... lizard tick *** Spur Tweed River NSW 1897 WW Frogget ...

Peter: ... ungulates or humans... snakes ... they get them on snakes ...

Ainsley: ... yep ...

Peter: ... they also get ones on elephants ... imagine how big they would be!

Ainsley: ... kangaroos. So if you want to ask yourself what animals can carry, or vector, a say a paralysis tick, we have a perfect record of that going back over a hundred years.

Peter: Insects can last for hundreds of years, the part you see in drawers like here, is the outer shell, unlike vertebrates that have an internal structure that keeps them upright, insects have all their hardened parts on the outside allowing them to stay - once correctly dried and preserved - they can last hundreds of years. So we can have them sitting here nicely on the end of a pin in some cases for a hundred and thirty years and still going strong.

Jordan: Hi I'm Jordan Bailey , I'm Leader of Plant Pathology Curation here at the Orange Agricultural Institute with the Department of Primary Industries. So I curate and manage the collection of dried, preserved plant diseases that includes fungi, bacteria and viruses. These are diseases of agricultural, horticultural, forestry crops, anything, everything. Things that have been intercepted at the ports that we don't have, things that have come in and then we keep record of where they've spread to, so any new hosts or new locations that they've been reported on and collected on and also new species entirely. So when you describe a new species of a plant or a fungus or anything like that you have voucher a specimen with an accredited herbarium collection so we take care of all of that for the Department of Primary Industries.

We have several compactus here and they all store these boxes, which I know are old and quite ratty, but we are going to be upgrading to special plastic containers in the future. All of these are filled with packets, each packet contains specimen collection information on these labels, which have all been handwritten once upon a time but we have transitioned into printed labels. So this includes species name, the hosts it's on, where it was collected, who collected it - a lot of collectors have their own personal collector number, that's included too - and then inside these packets will be the dried specimen, and any other photographs they've taken or hand notes or things they thought were interesting.

So the collection here, it being a reference collection - source of DNA - but also being a reference collection for morphology , confirming species diagnosis. Elizabeth Macarthur Agricultural Institute does a lot of the diagnostics these days but sometimes you have to go back to the original - it's called a type - collection of when that was first described to look at very minor details and make sure 'yes I have this', 'it is this disease', 'it is new', 'it isn't new', 'yes it's in a new area' things like that.

So the monitoring we were doing, if we were to find something it would be described and vouchered here. We have about a hundred and twenty thousand specimens of dried, preserved, dead specimens but we also have five thousand living cultures.

Karren: My name's Karren Cowan, I look after the living cultures here at the Orange Agriculture Institute. We have about five or six thousand living cultures here in the collection. We keep these to have them available for people that want to do research, they could be for teaching purposes, they could be looking at new projects or research projects they're getting. So we have them here and we keep them in pure form. Some of the cultures here that we have go back to the mid-1970s and they are still viable and grow well.

