

# **NATIONAL CERTIFICATE IN FOREST HEALTH SURVEILLANCE**

## **FOREST AND TREE HEALTH FIELD MANUAL**

## **National Certificate in Forest Health Surveillance**

This Manual has been produced as a source of reference material supporting the National Certificate in Forest Health Surveillance

Compulsory units making up the Qualification are as follows:

Unit 5870	Demonstrate knowledge of forest health and protection principles
Unit 1135	Demonstrate knowledge of nutrient management in commercial forestry
Unit 1241	Demonstrate knowledge of plantation forest establishment and silviculture
Unit 1126	Demonstrate knowledge of botany for commercial forestry
Unit 1131	Demonstrate knowledge of seeds nurseries and tree improvement in commercial forestry
Unit 14666	Demonstrate knowledge of earth science for commercial forestry
Unit 14667	Demonstrate knowledge of forest ecology
Unit 16819	Demonstrate knowledge of global biosecurity and the New Zealand response
Unit 5695	Identify the characteristics and control of forest insects
Unit 5696	Identify the characteristics and management of forest pathogens
Unit 5697	Identify abiotic disorders affecting forest and tree health
Unit 5871	Assess forest health from the air
Unit 5872	Assess forest health in plantation forests on the ground
Unit 5873	Assess forest health in forest nurseries
Unit 6916	Demonstrate knowledge of the Code of Practice relating to chainsaw use
Unit 6917	Operate a chainsaw
Unit 17769	Demonstrate knowledge of the general requirements for employment in a plantation forest
Unit 1123	Use maps and photogrammetry to survey land for commercial forestry
Unit 1124	Use maths and statistics functions and procedures in commercial forestry

Elective units which can be selected to complete the Qualification are as follows:

Unit 5874	Assess forest health in native forests
Unit 5875	Assess tree health in the urban forest environment
Unit 18615	Demonstrate the use of the Global Positioning System in forest operations
Unit 5700	Identify insects and fungi in forest produce for export
Unit 5705	Demonstrate knowledge of quarantine methods and controls for forest produce
Unit 19058	Ride a Special Purpose Vehicle (SPV) / All Terrain Vehicle (ATV) on undulating terrain

For full details of the requirements of the National Certificate see Appendix Three

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## FOREST AND TREE HEALTH SURVEILLANCE MANUAL

This Manual has been produced as a source of reference for the training of people involved in the surveillance of trees and forests to detect symptoms of health disorders, and incursions of exotic pests and disease, and to support the ongoing development of the methodology of the detection of exotic organisms.

### Introduction

The objectives of forest and tree health surveillance are to:

- *Detect:*
- *Identify:*
- *Assess:*
- *Report:* and
- *Monitor:* tree health disorders

New Zealand's forests, both exotic and indigenous, are vulnerable to incursions of pests and diseases entering through trade and tourism pathways. The large and ever increasing volume of shipping and air cargo containers; the increasing numbers of foreign tourists visiting New Zealand; and New Zealanders returning from overseas; pose a threat to the country's primary industries, and to the environment itself.

## **New Zealand's system of biosecurity protection has a three part structure:**

### **International Treaty and Protocol Agreements (PRE-BORDER QUARANTINE)**

Phytosanitary Certificates by countries recognising the International Plant Protection Convention; phytosanitary agreements with individual countries; and notification of New Zealand Import Requirements via the Ministry of Agriculture and Forestry and Trade Organisations. The Ministry of Agriculture and Forestry also conduct some inspections in foreign ports of origin at times of known high biosecurity risk, and of high risk situations such as military vehicles and equipment returning from overseas postings.

**Prevention and Detection (BORDER QUARANTINE)** Inspection of the baggage and personal effects of the passengers and crew of incoming aircraft and ships; inspection of air and sea cargo, used vehicles and machinery; the personal effects of immigrants, and overseas mail, by the Ministry of Agriculture and Forestry Quarantine Service, at International Airports and Seaports, and the International Mail Centres.

### **Early Detection (POST BORDER SURVEILLANCE) by:**

Inspection of shipping containers at transitional facilities by Importer's Accredited Staff

High Risk Site Surveillance of the environs of Transitional Facilities and other trade pathways by the MAF Biosecurity New Zealand Surveillance Providers

Surveillance of the environs of International Airports and Seaports, and Vegetation Rich Areas (VRAs) such as parks, golf courses, botanical gardens, etc, by the MAF Biosecurity New Zealand Surveillance Providers

Pest specific pheromone trapping programmes by the MAF Biosecurity New Zealand Surveillance Providers

Permanent Viewpoint monitoring of forest condition by forest owner's staff and Surveillance Providers

Forest health surveillance by the Forest Owners Association and Surveillance Providers

Permanent Forest Health Plots established by the Forest Owners Association to monitor forest condition over time.

Forest Nursery inspections by the Forest Owners Association and Surveillance Providers

Indigenous forest inspections by the Department of Conservation and Surveillance Providers

Passive and vicarious detection by members of the public, is supported by MAF Biosecurity New Zealand publicity leaflets and specific pest campaign material.

## SECTION 1: POST-BORDER SURVEILLANCE ADMINISTRATION

The **Ministry of Agriculture and Forestry Biosecurity New Zealand** provides tree health surveillance cover to:

- Environs of International Airports and Seaports
- Environs of sites of high risk such as transitional facilities
- Urban trees, and Vegetation Rich Areas
- Pest Specific Surveillance through pheromone trapping programmes
- Providing support for the passive surveillance of members of the public

The **Forest Owners Association** provides forest health surveillance as follows:

- Annual surveys of Plantation Forests
- Monitoring of Permanent Forest Health Plots
- Permanent Viewpoint Surveillance of forest condition
- Forest nursery inspections
- High Risk Forest Sites associated with Wood Processing Sites and other identified industrial sites

The **Department of Conservation** provides surveillance of:

High Risk Sites in and around Indigenous Forests

The primary objectives are:

1. To detect incursions of new exotic organisms.
2. To monitor and assess existing exotic and native tree health disorders.

### **Cost**

The cover of port environs, Vegetation Rich Areas such as parks, golf courses, and botanical gardens; high risk site surveillance, and the survey, eradication and/or monitoring of new incursions of exotic organisms, is funded by MAF Biosecurity New Zealand.

The cost of forest health surveillance in exotic forests and forest nurseries will be at a rate negotiated by the Forest Owners Association.

The management of already established problems may be supported by MAF Biosecurity New Zealand, Local Authorities, Industry Associations and other organisations.

### **Collections and Collection Inspection Forms**

The majority of health problems will be identifiable from field symptoms and dealt with locally by the Surveillance Provider. Surveillance Providers are required to forward collections of anything that they are uncertain of to the diagnostic laboratory at **ensis** for checking. Collections are to be forwarded to the diagnostic laboratory in the following circumstances:

- Identification of insect or fungus causing damage.
- Identification of the cause of the damage.
- Confirmation of a new district location for a fungus or insect.
- Suspected new host record for a fungus or insect.
- Specified item requested by diagnostic staff.

All collections must be accompanied with a collection form. A copy will be returned with the diagnosis. The original will be used for data entry for the Forest Health Database. Details of the basic requirements of Collection Forms are attached as Appendix One.

### **Health Inspection**

Inspection forms should be completed in the field and should contain information on the frequency of a problem and an assessment of the damage.

Inspection forms are to be completed and forwarded in batches to the **ensis** diagnostic laboratory for entry into the Forest Health Database, and also to the FOA Forest Health Committee. Copies should be retained for reference, and used to assist the Surveillance Provider compile a forest health report. A Health Inspection is to be completed:

For **every** plot inspection:

When a problem causing significant damage is detected.  
Surveillance Provider discretion can be used for long standing problems such as Dothistroma and Cyclaneusma.



## SECTION 2: DETECTION SURVEYS

Forest Health Surveillance programmes are conducted annually or as required for the detection of new introduced forest insects and fungi.

### Forest Health Surveillance of Exotic Forests

#### Frequency

Annually, at any time of the year, but preferably at different times from year to year.

#### Minimum Forest Health Cover

The minimum level of exotic forest health surveillance cover will be as specified by the Forest Owners Association Forest Health Committee and will be negotiated annually or biannually

It may include:

- A forest **Aerial Survey** to include where possible photography, to cover all forests, with follow up ground surveillance of suspected disorders.
- A **Drive-through Survey** from the forest roading system covering the forest at a specified intensity expressed in metres of road per hectare, (currently a minimum of 15 metres of road per hectare of forest), with follow-up ground surveillance of suspected disorders.
- One **Permanent Viewpoint Survey** plot per 1000ha of forest, with follow-up ground surveillance of suspected disorders.
- Three **Temporary Health Plots** per 1000 hectares of forest, based on transects to investigate disorders recorded in the surveys, (investigative); or to assess the general health of the forest (random).
- Approximately 30 **High Risk Forest Sites**, with four transect plots per site to detect incursions of exotic organisms

**Tendering for the provision of Forest Health Surveillance is based on bioregions and zones**

### Forest Zones

As from 2005 the Forest Zones are as follows:

	<b>Bioregion</b>	<b>Area (Hectares)</b>
Zone One	Auckland .....	24902
	Northland.....	115931
	Coromandel.....	20856
Zone Two	Taupo Kinleith .....	93454
	Waikato .....	12857
Zone Three	Bay of Plenty Coastal .....	70984
	Bay of Plenty Foothills.....	77960
Zone Four	Taupo Plateau.....	203556

	<b>Bioregion</b>	<b>Area (Hectares)</b>
Zone Five	Hawkes Bay ..... Rangitikei ..... Taranaki ..... Wairarapa..... Wanganui..... Wellington .....	74209 11466 6179 29814 17776 7710
Zone Six	Buller ..... Kaikoura ..... Marlborough ..... Marlborough Sounds..... Nelson ..... Nelson/Marlborough/Marlborough Sounds ..... Westland .....	17851 26 23353 8125 73947 7355 12245
Zone Seven	Mid Canterbury..... North Canterbury..... South Canterbury .....	26435 27579 10108
Zone Eight	Central Otago..... Dunedin..... Fiordland ..... Mackenzie ..... Otago Lakes..... Southland .....	8765 58857 2517 142 1924 43249
Zone Nine	Gisborne.....	137285

## Forest Health Surveillance

### Aerial Survey of Forests

All exotic forests of more than 100 ha are flown once a year. It is thought that the symptoms of about 13% of the insects and diseases that could become established on Radiata Pine can be detected from the air. Although aerial observers probably only notice about 60% of the detectable symptoms present, it is still the best \$ option per percent of detection.

The objective of an aerial survey is to detect any ill health symptoms and plot their location on a map, wherever possible using GPS. These locations are later checked on the ground so accuracy of plotting is important. Skill and experience is needed to both search for symptoms and relate their position to a map. Skill is required by the pilot and navigator to maintain the aircraft to a predetermined course. Preferably, forests should be flown on predetermined GPS transects, but if the terrain prohibits this, or the forest is too small, then catchment flying or a route around the forest may be used. Aerial inspections are to be organised as follows:

Aerial inspections are to be conducted by an experienced observer.

There is an advantage in having a second person to act as a navigator.

Two full copies of forest maps (or best available) of each forest being flown is desirable. Both copies are to be marked with identical transect lines spaced every 1000 metres, or route lines

similarly spaced in the case of catchment flying. All routes over forests must be pre-planned, using a GPS unit to guide the pilot and ensure coverage of the forest area.

Book a high-wing aircraft with an experienced, commercially rated pilot. The aircraft used most is a Cessna 172, but for forests with very steep terrain there will be advantages in chartering a more powerful (more expensive) aircraft with a higher climbing rate. The aircraft must be fitted with an emergency locator beacon in case of a forced landing.

Brief the pilot before getting into the plane on the flight specifications: flight duration, route, height, airspeed, transect width and the forest health objectives. Plan for flights of no more than 2-3 hours duration with no more than two such flights per day.

Flight specifications for most of the flying will be:

altitude: 800 - 1000 ft a.g.1. (NB ft not metres)  
airspeed: approximately 70 knots (usually with 10 degree flap)  
transects: 1000 metres apart  
weather minima: avoid conditions where: winds exceed 15 knots, dull, low cloud base, mist, threat of rain, snow on ground, two hours after sunrise and two hours before sunset.

Poor light or small trees tempt one to fly lower, but you would then find it difficult to see far enough to over-lay the next transect. The pilot may want to know the altitude of the highest and lowest parts of the forest, and the presence of any hazards such as transmission wires.

Symptoms should be plotted as near as possible to their exact location on forest maps as you fly past. GPS waypoints should be used, although symptoms on the edge of the flight path still need to be estimated. Experience indicates that a red ballpoint pen shows up best for marking locations on the map. The following symbols are standard and should be known by all staff involved in aerial inspection work.

M	indicates mortality
T	indicates dead or dying tops
D	indicates defoliation (not dead)
O	indicates off colour
Y	indicates severe yellowing
S	indicates storm damage
B	indicates burnt
X	indicates exact location
6 etc	indicates number of trees with the problem
#	indicates numerous trees affected

Make a note of the time you first arrive over a forest and the time you depart  
This information is needed for estimating costs for planning future cover.

On landing a certain amount of paper work is required as follows:

- Agree with the pilot on the time flown, having made a note of the takeoff and landing times.
- Confer with the other observer (if available) and transfer all plotting to one map. A master map retained in the office is an advantage.

It is useful to know that the blind spot under the aircraft at 1000 ft a.g.1. will be over 300 metres wide. For very steep terrain you will need to reduce the altitude from 1000 ft to 500 ft, with a subsequent reduction of transect width.

**Do not identify a problem from the air.** Do not make any assumptions, and at least ground check a sample of all the symptoms noted whilst in the air. Looking forward at a 45 degree angle appears to give the observer more time to relate to their position and anticipate plotting needs. Photography using a digital camera must be used wherever possible.

A low level aerial assessment for Dothistroma infection levels does not constitute adequate general forest health aerial inspection cover. It is a good addition, but it is deficient in the age classes and tree species covered, it is specialised for assessing Dothistroma, and at low level one cannot see sufficient distance to provide adequate cover of the forest.

#### Ground Verification of Aerial Detections:

Ground verification checks of the aerial detections are to be made within two months of the flight. Detected problems are to be treated in the normal manner of any discovered forest health problem. This aspect of health cover may be conducted in conjunction with the ground inspections via the forest roading system, using GPS locations, to the datum of the map(s) being used.

Civil Aviation Regulations 1953, Regulation 38; Minimum safe heights. Relevant extracts are as follows:

- “no aircraft shall be flown over any city, town, or populous area except at such altitude as will enable the aircraft to complete a safe landing”
- “at a lower height above the area than 1000 ft; or any other area at a lower height above the area than 500 ft. Reference to height here is “the height above the highest point of the terrain or any obstacle thereon, within a radius of 2000 ft of a line extending vertically below the aircraft”
- “The provisions of subclauses (1) and (2) of this regulation shall not apply if:
  - (a) Stress of weather
  - (b) The aircraft is engaged in operations of a nature which necessitates low flying and approval has been given by the Director either for all flights or for a specific flight or flights to be made at a low altitude, and the flight is in accordance with such conditions as the Director may prescribe.
  - (c) The aircraft is landing or taking off.”

#### **Drive-Through Roadside Survey**

The drive-through survey provides an overview of the general health of the forest, and identifies symptoms of forest ill-health requiring closer inspection.

The drive-through inspection, searching for and checking symptoms of tree health disorders through the whole forest, is conducted via the roading system. The intensity of the drive through will depend on the FOA specifications for the forest. The minimum specification is 15 metres of road per hectare of forest. The average drive through speed, allowing for stops has been estimated to be 15 km per hour, but where there is an abundance of symptoms some forests may require more stops than others. Forest roading densities usually range from 15 - 30 metres/ha and the probability of detecting a 20 hectare infection point in a forest using the roadside survey is:

Roading density	15 m/ha	20 m/ha	25 m/ha	30 m/ha
Probability of detection	38%	51%	64%	77%

Specific inspections are to be made for introduced insects and fungi not yet known to be established in a forest, and at specific points where forest staff consider there are symptoms that should be checked.

#### **Permanent Viewpoint Plots**

The Permanent Viewpoint method of monitoring the condition of the forest is a forest management tool designed to provide a broad measure of forest condition change over time. The method provides early warning of the increased impact of specific pests and disease, and information on the health status of the forest estate at a local, regional and national level.

The method also promotes closer communication between the Surveillance Providers and Forest Management, and a greater awareness of forest health issues at both a forest and company level.

One Permanent Viewpoint Plot is established per 1000 hectares of forest.

Full details of the methodology is attached as Appendix Two

### **Temporary Health Plots (Transects)**

Temporary Health Plots are established for two purposes:

1. To investigate symptoms of tree and forest health disorders detected on the aerial, drive-through, or viewpoint surveys.
2. To assess the general health of the forest by close inspection of random samples of the forest.

The Transect size and frequency is established by the Forest Owners Association contract document requirements. (Currently transects of 100 metres x 10 metres; and 3 transects per 1000 hectares.

The location of the transects is random, except in the case of the transects established to investigate tree health problems as described above. In this case the frequency is varied according to the extent and nature of the problem or suspected problem.

In a healthy forest there will be 3 transects per 1000 hectares, all randomly located.

The procedure is as follows:

The entry point to the stand is marked by attaching an ID card (weather resistant, with the name and company of the inspector, and the date and direction of the transect plot). A second card is attached at the end of the transect. GPS waypoints may also be required at the start and end of the transect for audit purposes.

Waypoints must be recorded using latitude and longitude and Geodetic Datum New Zealand 1949.

When the Temporary Health Plot is established to investigate a symptom observed from the aerial, drive through, Permanent Viewpoint Plot, or report by forest staff, the information source must be recorded, with the location, and with details of the disorder if identified, or samples taken for dispatch to the diagnostic laboratory.

All suspicious symptoms are to be investigated.

It is expected that a beating sheet will be used at least once on one of the 3 plots per 1000 hectares.

During the course of the intensive surveillance cover, all arborescent vegetation within 5 metres of the transect centre will be examined for insects and fungi not yet known to be established in the forest.

The average time to complete one plot is considered to be 30 minutes, with a further 10 minutes allowed for positioning and form filling. However, time will vary depending on tree age, accessibility, and steepness of the terrain.

Inspection details are to be recorded on an "Inspection/Collection Form". See Appendix One for details.

Specialised surveillance methods, used to detect insect populations free on foliage; insects attached to foliage; insects in the cambial zone; wood borers, and soil inhabiting insects, should be used at least once in every 500 square metres of transect. The emphasis should be approximately 90% on the use of a beating tray to collect insects free on foliage, with the other methods making up the other 10%, using a random sampling method (e.g. a random number table) to select the method.

### **High Risk Forest Sites**

A total of approximately thirty sites associated with identified high biosecurity risk are established nationally, and will be monitored for incursions of exotic organisms.

The monitoring method is by 100m x 10m transects located strategically at a frequency of 4 per High Risk Forest Site, centred on a GPS point provided by the Forest Owners Association. Assessment methods are the same as for the Temporary Health Plots.

The FOA surveillance specification for High Risk Forest Sites requires inspection at close range of all arborescent vegetation within the transect.

### **Permanent Forest Health Plots**

A series of permanent forest health plots are to be established throughout the exotic forest estate. Details are yet to be finalised.

### **Forest Nursery Surveys**

Tree health surveys of forest tree nurseries are to be undertaken. Details are yet to be finalised.

### **Reporting**

A report should be forwarded to the forest owner within 20 working days after completion of the total survey, or at intervals eg for parts of a forest if a large forest is involved. Copies of the report may be required by the forest owner, MAF Biosecurity New Zealand and for Data Base requirements.

### **Inspection Form**

A copy of the inspection form must be completed:

- For every forest survey and assessment plot,
- When a problem causing significant damage is detected.

## High Risk Forest Sites as identified by the Forest Owners Association Forest Health Committee

JNL Mill .....	Kaitaia
Glenbervie Forest .....	Whangarei
Maungatapere Forest.....	Whangarei
Waipu Forest.....	Marsden Point
Woodhill Forest – Selwyn Road.....	Auckland
Riverhead Forest – Forest Road.....	Auckland
Whitford Forest – HQ .....	Auckland
Kopu Mill – CHH .....	Kopu
Taikato .....	Rotorua
Kerosene Creek.....	Rotorua
Kinleith Forest – Rubbish Tip – Access Road.....	Tokoroa
Kinleith Forest – David Henry Grove .....	Tokoroa
Murupara Railhead .....	Murupara
KPP .....	Kaingaroa
Kawerau A10 .....	Kawerau
Turangi.....	Turangi
Winstones Forest.....	Ohakune
Forest Near Port .....	Gisborne
Tangoio Forest.....	Napier
Ernslaw Forest.....	Dannevirke
Santof Forest .....	Wanganui
Hocking Farm (2km from Ohakea).....	Ohakea
Lismore Forest.....	Wanganui
Wellington City Council .....	Wellington
Kaituna Sawmill .....	Blenheim
Rabbit Island.....	Nelson
Eves Valley Sawmill .....	Nelson
Nelson Pine Industries .....	Nelson
Hanmer Forest.....	North Canterbury
Sefton MDF Mill .....	Rangiora
Bottle Lake Forest.....	Christchurch
McLeans Island Plantation.....	Christchurch
Bob's Peak Plantation.....	Queenstown
Naseby Forest.....	Central Otago
Conical Hills Forest.....	West Otago
Cedar Farm Forest.....	Dunedin
Flagstaff Forest.....	Dunedin
Invercargill City Council Forest .....	Invercargill

## Health Survey of Forest Tree Nurseries

**The inspection of Forest Tree Nurseries may be scheduled annually, or biannually, by the Forest Owners Association Forest Health Committee**

### Frequency

According to the FOA schedule, but generally annually, during April - May, or when the nursery manager considers it most suitable. The inspection time will be influenced by local nursery practice and to suit the time when seedlings are large enough to inspect. The objective is to check the seedlings for symptoms prior to their being distributed for planting.

### Cover

The minimum level of nursery health surveillance is as agreed upon by the FOA Forest Health Committee, but generally seedlings are to be examined prior to their being lifted and dispatched to a forest for planting.

The objective is to check tree stocks for ill health symptoms, so that none are carrying a serious insect or fungus when sent out to a forest. These inspections should be at the rate of 4 (four) million seedlings per day by walking down every 10th seedling alleyway. Where available the following situations should be examined:

- First year seedlings
- Second year and older seedlings
- Individually treated stock e.g. lined out, grafts, etc
- Experimental seedlings
- Ornamentals
- Vicinity to the nursery and its environs.

The last category will cover trees and shrubs bordering the nursery where the incidence of a disease may be easier to detect because of longer exposure.

### Report

A report should be forwarded to the owner within 20 working days of completion of the survey. Copies of the report will be required by the nursery owner, MAF, and **ensis**. MAF can issue a certificate indicating that the seedlings have been checked for health by a Surveillance Provider.



### Inspection Form

Copies of Inspection forms must be completed for:

- Every category type checked,
- When a problem causing significant damage is detected.

### Reporting

A brief report is required to indicate when and what locations and hosts were covered, what was detected and an opinion on areas of concern. This report should be forwarded to:

- MAF Biosecurity New Zealand
- **ensis**
- Local Council Parks and Reserves, as appropriate

### Collection Forms

A collection form must accompany every collection forwarded to the Diagnostic Laboratory.

**NB:** Where there is suspicion that a new introduced disease has been detected material is to be double wrapped and marked on the outside "Open under Quarantine Conditions". Action should follow the **MAF Exotic Disease Response Programme**.

### Inspection Form

These are to be completed when a significant health problem is detected. In which case it is to be completed in the field and forwarded with the collection.

## **Problem Management**

A problem is defined as: when insects or fungi are associated with:

- 5% or more of trees are affected, or
- 5% or more of the foliage etc of a tree shows damage, or
- when irrespective of incidence the FHO considers symptoms are significant.

Exemption is given to problems that are common and assessed in separate surveys, eg. Dothistroma or Cyclaneusma.

When a problem within the above criteria is detected an assessment is required to determine its extent and intensity. It is suggested that an assessment should consider one of more of the following:

- Area of tree crown affected?
- Area of forest with the damage?
- Percentage of trees affected?

The required information can be obtained by an assessment of the problem by one of the applicable sampling methods contained in Section 7, or one can design a method to suit the problem. If the terrain or vegetation make assessment by close examination impossible, then a visual estimation from a distance (using binoculars) can be made from a vantage point(s). Significant problems may require further assessments to monitor progress, and an aerial survey might be required.

### Inspection/Collection Form

An Inspection/Collection form must accompany every collection forwarded to the diagnostic laboratory.

## Contingency Plan

A copy of this plan must be carried in the Surveillance Provider's vehicle, and another copy retained in the company office.

The procedures specified are to be closely followed during the FOA Forest Health Surveillance Scheme where there is a possibility that a new exotic insect or disease has been discovered; or in the event of the discovery of a significant tree health problem.

### New Exotic Organism

In the event that there is a distinct possibility of detection of a new exotic organism; particularly if of an organism described in the publication “**Exotic Pests and Diseases of Pines Not Wanted in New Zealand**”, the Surveillance Provider must:

- Record a detailed description of the organism, the location (including latitude and longitude), any damage to vegetation, the extent, the host, and any other details, with digital photographs if possible. Do not take samples of fungal pathogens as there may be a risk of spreading the problem further.
- Contact the **MAF Exotic Disease and Pest Hotline 0800 809966**
- Contact **ensis 07 343 5899**
- Contact the Forest Owner and seal off the area.
- Contingency Action will be taken by **MAF Biosecurity New Zealand**

**During the above course of action it is essential that the Surveillance Provider ensures that there is no possibility of spreading the infection via the Surveillance Provider's vehicle, clothing, or equipment. MAF Biosecurity New Zealand will provide instructions on immediate action. This may involve implementing actions under the Biosecurity Act, such as declaring a Controlled Area, which may involve closing down forest operations, or closing roads or tracks. If the detection is outside of the forest boundary, MAF Biosecurity New Zealand will provide specific instructions. In any case, clothing should be changed, and the vehicle cleaned before leaving the infected area. The area must be treated as a Controlled Area, until declared otherwise.**

In the event of there being an **Initial Investigation or Response**, MAF will take control of operations under the **MAF Exotic Disease Response Programme**.

### Known Disorders

In the event that there is a serious outbreak of a known disorder, or a new range of a known disorder the Surveillance Provider should:

- Write a detailed report of the disorder, including the location, the extent, the host, the damage, and any other pertinent details.
- Contact the Forest Owner and submit the report.
- Contact **ensis 07 343 5899** for directions on action to be taken.
- Collect samples of the disorder for sending to **ensis** for diagnosis, as or when requested.
- Complete a Collection Form as described in **Appendix One** of this Manual
- Contingency Action will be taken by the Forest Owner in consultation with **ensis** and the **Forest Owners Association Forest Health Committee**.

During the above course of action and subsequent to it, the Surveillance Provider is required to ensure that there is no possibility of spreading the problem via the Surveillance Provider vehicle, equipment, clothing, or samples and collections. Consider the need to clean the vehicle and change clothing before leaving the infected area. Dry cleaning of clothing should be considered.

## **Packaging for Different Types of Collections**

**All collections have to be accompanied by a collection form.**

### Wood boring larvae or adults

Pack singly with tight wads of cellulose in a test tube. Do not put an airtight stopper on the tube. Chunks of wood or bark containing larvae should be wrapped in paper. Dispatch in an insect proof container. If dispatch is delayed by more than one day, store the sample in the refrigerator.

### Soft bodied insects (eg psyllids and aphids)

Collect specimens of each life stage, if possible. Place in a small tightly stoppered vial filled with 70-80% ethanol. Wrap vial in paper and place in a film canister for posting. If ethanol is not available, (although many pharmacies sell it), then place specimens in a paper bag with foliage. Tissue paper should be included to soak up excess moisture. Post samples as soon after collection as possible.

### Defoliating insects

Pack live in newspaper or brown paper containing adequate fresh host foliage, and then into a paper bag. Dispatch in an insect proof container.

### Soil inhabiting insects

Place in a plastic bag containing spagnum moss or damp paper (not wet). Dispatch in an insect proof container.

### Mushrooms

Select fresh specimens and avoid those that have started to break down. Wrap in dry newspaper or brown paper. Do not use tissue paper. Place in a plastic bag to prevent drying out. Dispatch by fastest means.

### Pathology samples general

Material must arrive in as fresh a condition as possible, i.e. as if ready for planting. Pack in stiff paper (brown paper or newspaper) and then in a plastic bag, but do not moisten the sample as this encourages the growth of contaminants. Dispatch by fastest means.

## SECTION 3: SPECIAL SURVEYS AND REQUEST WORK

Special surveys and requests for work may be required from time to time to determine the distribution or damage intensity of a health problem.

### Special Surveys

When a special survey for a specific problem is required, separate instructions will be issued. No hard and fast rules can be laid down without knowing the insect or fungus involved. The priority a survey has over other work may be stated in the instructions.

**High Risk Site Surveillance (HRSS) in the environs of Transitional Facilities and devanning sites; and sites associated with the importation of used vehicles and/or machinery**

**The environs of International Airports and Seaports, and Vegetation Rich Areas (VRAs) in the vicinity of International Ports**

**Pest Specific pheromone trapping of targeted pests associated with detection and eradication programmes**

### High Risk Site Surveillance

Biosecurity New Zealand has developed a Standard for High Risk Site Surveillance (HRSS) issued as ISBN 0-478-07878-1.

This comprehensive document details the methods and procedures for surveillance of **Risk Site Areas (RSA)** in the vicinity of identified transitional facilities, devanning sites, facilities dealing with imported used vehicles and machinery, and **Vegetation Rich Areas (VRA)**

The Standard establishes a series of transects of varying size, in RSAs, and develops a **Transect Vegetation Description, (TVD)** for each, recording the dominant, unusual, ecologically important or iconic vegetation species present, for reference in subsequent inspections, and each transect is given its own unique alpha-numeric code.

**Risk Site Areas** are arbitrarily defined within a boundary, which may be:

- (a) a radius from the estimated centre of a port;
- (b) a radius from the estimated centre of a non-port RSA;
- (c) a Polygon surrounding an aggregation or cluster of non-port RSAs; or
- (d) The natural boundaries of a **Vegetation Rich Area** associated with a risk site.

Surveillance is then focussed on the arborescent or herbaceous vegetation within the RSA.

Detection of exotic organisms within a RSA is categorised as:

**Primary Detection** – detection of a suspect new to New Zealand, or new to science, organism, that has biosecurity implications and is diagnosed and validated to confirm the species.

**Secondary Detection** – detection of an organism that is already known to occur in New Zealand, and has previously been subject to a Primary Detection; and that is

- (a) living or feeding on herbivorous or arborescent vegetation for which it has never been previously recorded in New Zealand;
- (b) detected in a Crosby Region for which it has not previously been recorded;

**Significant Detection** – detection of an organism which:

- (a) has previously been reported as eradicated in New Zealand; or
- (b) is currently subject to an eradication attempt, where the new detection has significant implications for that response (e.g. in a new Crosby Region or outside the defined response area), or
- (c) is a new sexual or life stage record for the species.

## SECTION 4: REPORTING

### Forest Health Reports

**The Forest Owners Association Forest Health Committee is to provide a template report form, but generally the report should follow the following guidelines.**

#### Front Cover

Individual organisations have their own ideas and format for report covers. Report covers should be presentable, and some form of binding should be considered. The minimum standard should include stapling in at least two points on the left hand edge and have a formal and consistent front cover title. For a little extra cost, stiff or coloured paper can be used. Film overlay gives a further level of improvement.

#### Title Page

The front cover identifies the report for what it is. The title page is specific and identifies which forest(s), dates and by whom (author) forest health surveillance was provided. One would expect the title page to be typed, and set out with a lot of space. You can combine the front cover with the title page. Where this occurs, the title information can be typed below the cover headings.

#### Contents

For a large report, a separate page listing of the report contents will be required. For a small report the list of contents can be added to the bottom of the TITLE page. There is room for variation, with different combinations for the front cover, title and contents pages.

#### Summary

This page gives a brief description of what was done. Even if a forest was healthy and there is little to report, the summary can indicate the level of specified cover provided. The summary can be in the form of a table indicating; Forest, Compartment, Species, Age, Condition or Pathogen, Incidence or degree of damage. A summary can also include information on:

- Organisation and results of aerial survey,
- Organisation and summary of ground inspection.

#### Main Body of the Report

It depends on the size of the forest and how much work was done to cover problems. There is clarity if you can divide this part of the report up into sections, eg:

Dealing with:

- Pathological problems
- Entomological problems
- Abiotic problems
- Nutritional problems
- Animal problems
- Noxious weed problems
- Other problems; which could include fire risks, trespass, road blockage, wind blow, or any other observations which will be of assistance to a forest manager.

Underline all scientific names. For the correct spelling of insect and fungus names refer to Section 7.

## Appendices

Consider the inclusion of a forest map to indicate the position of aerial transects, sample points, ground survey cover and significant detections.

Consider the inclusion of photographs, electronic copies of photographs, photocopies of reference material on problems covered, and treatment specifications.

List the collections made, and give the **ensis** diagnostic replies available.

Indicate that you will forward results later if they are not yet to hand.

### Distribution

There may be local distribution requirements by local forest owners or companies. Apart from these the obvious distribution to be considered should be to:

- The Forest Owner (and if there was a significant forest health problem), to:
- Forest Owners Association Forest Health Committee
- MAF Biosecurity New Zealand
- **ensis**

### Addressing Mail

A high proportion of outward mail will be in the form of collections to **ensis**.

Collections sent to **ensis** should be addressed:

Mail: **ensis**  
Forest Biosecurity and Protection  
Private Bag 3020  
ROTORUA  
  
Phone: (07) 347-5899  
Fax: (07) 347-9380  
Attention .....

Consignment of Goods: **ensis**  
Te Papa Tipu Innovation Park  
49 Sala Street  
ROTORUA  
Attention .....

An **ensis** address list is issued from time to time. It will contain the contact addresses of all applicable staff working in forest health.

## SECTION 5: ASSESSMENT METHODS

### Objective

This section contains various methods of assessing different types of problems. There will be times when none of these methods fit the circumstances and the Surveillance Provider will need to improvise. The objective is to produce quantitative data on the incidence of a population, severity of damage, or incidence of a problem. The method of assessment may be simple and only involve counting trees, eg. transect or from a ridge top through binoculars, or involved with cutting off foliage and examining individual needles. Endeavour to use the specified systems when ever possible because they will relate to other assessments.

### Recording

Complete a Health Inspection Form and enter the assessment results on the form. Collectively these will be very valuable records indicating the level and circumstances of damage one can expect from a wide range of forest health problems.

### **Assessing Infection or Defoliation on Individual Trees**

The measurement of Dothistroma infection on individual trees is based on the assumption that the fungus usually infects and causes defoliation to the lower part of the crown first. An imaginary horizontal line between the uninfected green foliage and the infected foliage is envisaged. The percentage of infected crown volume is then estimated in relation to the total unsuppressed crown.

The method used for assessing levels of Dothistroma can be applied to defoliation caused by insects and other fungi. The main criterion is that there is a clear definition between the damaged and undamaged areas of a tree crown.

Scoring of individual trees is done in 5% steps, eg 5, 10, 15 etc. A score of 1% can be used to indicate that the disease etc is just detectable. In areas where Dothistroma is known to have been established for some years a 1% score can be assumed.

Dothistroma surveys are the responsibility of forest management, but technical assistance can be contracted. The infection level survey for a control spray programme should be conducted for *P. radiata* between July and early August, and for *P. nigra* and *P. ponderosa* (for some regions) in November or January of the previous summer. Since Dothistroma can still be developing on *P. radiata* in July, it is considered that by September there can sometimes be an increase of up to 10% visible infection on a July assessment figure.

Refer to the latest edition of "Assessment and Control of Dothistroma Needle Blight" for greater coverage of survey and treatment of Dothistroma.

### **Assessment of an Area of Trees Affected by a Problem**

These instructions are designed to cover the assessment of a problem affecting individual planted or regenerated trees in a forest.

### Methods

Where there is reasonable assess and the trees have been planted in rows:

- Study the compartment or area to be sampled, and determine the best representative location for a staggered line transect. It can be placed through the longest achievable length of the compartment, or it can start at a road or break, and after a set number of trees can reverse direction in a V formation that comes out further down the road from where you started.



- The usual staggered line configuration is: 10 trees down a planted row, move over two rows, and then down the row for a further 10 trees, etc.

Where there are regenerated trees:

- Traverse a straight line transect across a representative section of the compartment or problem area. You can follow a compass bearing, sun angle or distant marker.
- Depending on stocking, use a predetermined distance from the transect centre line to regulate which trees are in or out of the swath, e.g. for a highly stocked area it may be only one metre wide, but for mature trees the width could be several metres.

Where there are both planted and regenerated trees:

- Combine systems 1 and 2, so that the planted rows act as the swath centre line.

Where access is limited due to vegetation, etc:

- There is no precise method recommended. Unless the problem is serious, one will be reluctant to cut access tracks or use aerial assessment or aerial photography.
- Use systems 1-3 for short runs where short access is obtainable. Use interior margin trees down narrow roads or breaks, or use circular plots where there are accessible points.
- Use a system of visual estimation from lookout points or road edges i.e. count the trees affected against the area of hectares in view.

### **Sampling Insect Population When Free on Foliage**

These instructions were specifically designed for sampling easily dislodged insects on tree foliage.

Beat the tops of branches with a standard size stick so that larvae are dislodged onto a standard size beating sheet held underneath. Definitions of the procedure are:

A beat = one firm blow with a standard beating stick on an area of foliage, below which is held a standard size beating sheet.

The area of foliage beaten is equal to, greater or less than the area of beating sheet is not important. What is important is that:

- Any foliage which has been disturbed by a beat should not be used for a subsequent beat.
- The direction of "fall out" should be watched to ensure the sheet catches everything. The direction of the blow and wind are determining factors.
- A point = a group of four beats taken as nearly as possible in the same area of the tree canopy.
- A sample = the result from 4 to 10 points.

The following conditions must be completed:

- Sampling must continue for 4 points, but at that stage or any time after, if 30 specimens of one species are taken, sampling can stop.
- Sampling will terminate at a maximum of 10 points.
- Insects touching the boundary line of the beating sheet will be counted.

## **Sampling Insect Population When Attached to Foliage**

These instructions are designed to cover sampling of insect numbers on foliage where it is difficult or impossible to dislodge them by beating.

With secateurs carefully cut 5 representative, 30 cm lengths of foliage (if possible from different trees) and place them on a sheet. Examine each cutting carefully for insects, and the sheet for any that may have fallen off. Record the insect species by; species, instars, size, or what ever breakdown you think is applicable.

Repeat the above 5 times. The sampling should be distributed over a number of trees, but this may be restricted by local circumstances.

## **Assessment of Insects in the Cambial Zone**

These instructions are designed to cover the assessment of bark beetles populations in standing trees, log or stumps, eg Hylastes, Hylurgus, or Arhopalus before it enters the wood.

Basically this sampling system involves the cutting and prising off, of a 20 x 25 cm (500 sq. cm) patch of bark, and counting the number of larvae, pupae, teneral adults and mature adults found in the cambium zone.

Up to 3 sample patches are required per tree, log or stump depending on size.

Sample at least 5 trees, logs or stumps to complete one assessment.

## **Assessment of Direct Entry Woodborers**

These instructions are designed to cover the assessment of woodboring insects that show evidence of their entry into the wood, eg. pinhole borers.

Basically this sampling system involves the counting of entry holes in a 20 x 25 cm, (500 sq. cm) patch, of surface area. The system can be applied to trees, logs or stumps.

Up to 3 sample patches are required per trees, log or stump depending on size.

Sample at least 5 trees, logs or stumps to complete one assessment.

## **Assessment of Soil Inhabiting Insects**

These instructions are designed for sampling insects in the soil, eg. Lepidopterous pupae, or Coleopterous larvae and pupae, etc. Beware of the uneven distribution of some insect populations, eg. Scarabaeidae.

Select a representative area and dig (trowel) or sieve through, 4 plot areas measuring 50 x 50 cm. The 4 plots constituting one sample should be all located within a 15 m. radius or along a 30 m. line. Dig to a depth appropriate for the insects e.g. 5 cm for Lepidopterous pupae or 20 cm. for Scarabaeidae. Carefully search the dug soil for the pupae or larvae etc.

Record the number of different development stages present, eg. larvae, pre pupae, pupae, teneral adults, mature adults and recently emerged pupal case remains.

Record the incidence of disease or parasitism, eg. Lepidopterous pupal cases with:

Top cut off	Ichneumon parasite
Minute holes	Eulophid parasite
Limp or stinking	Diseased.

### **Assessment of Damage in Nursery Seedlings**

These instructions are designed to cover the assessment of damage in nursery seedbeds.

Decide on the seed bed(s) to be sampled. It can be part of one bed if the damage area is small, or can be representative, eg every 5th or 10th seedbed etc.

If available, use a 0.5 x 1 m. frame used for seedling stocktaking. Sample strips of 0.5 m. width across the beds every 10 m. to give a 5% sample.

Record the incidence by damage class headings e.g. healthy, damaged and dead. It may be possible to record different degrees of damage. Depending on the extent of the problem, one sample should contain at least 10 of the sample strips.

### **Assessment of a Problem in a Native Forest**

These instructions are designed to cover the initial investigation of a problem in native forest. A Health Inspection Form is to be used and the information entered as follows:

- Location data as normal.
- Host data as applicable.
- Damage data entry as normal and according to the type of damage. One of the previous assessment methods might be applicable.
- Further comments to cover;
- Description of forest type
- Area of damage
- Topography
- History, eg. logging, animals etc.
- Elaborate on damage symptoms and associated insect or fungi.

## **SECTION 6: FOREST HEALTH DATABASE**

### **Data Base Form**

There is one basic form used as a Collection Form, and/or Inspection Form.

The following conditions apply for the completion of the form:

- (a) All writing for data entry areas must be printed.
- (b) Use codes as indicated.
- (c) Use full scientific names
- (d) Use a broad tip blue ball point pen.

## Inspection/Collection

### FOREST HEALTH INSPECTION/COLLECTION FORM

A 100001

PATH/ENT

#### SITE DETAILS

Owner name: \_\_\_\_\_ Site Code: \_\_\_\_\_  
 Location: \_\_\_\_\_  
 Stand: \_\_\_\_\_ Area (ha): \_\_\_\_\_  
 Site Type: \_\_\_\_\_ Lat: \_\_\_\_\_ Long: \_\_\_\_\_ Bioregion: \_\_\_\_\_

#### INSPECTION DETAILS

Date: \_\_\_\_\_ Surname: \_\_\_\_\_ Initials: \_\_\_\_\_  
 Host Species: \_\_\_\_\_ Treatment: \_\_\_\_\_  
 Estab. year: \_\_\_\_\_ SPH: \_\_\_\_\_ Diam (mm): \_\_\_\_\_ Height (m): \_\_\_\_\_ Insp. Type: \_\_\_\_\_

#### DISORDER

Disorder Description	Agent Name	Aspect	Terrain	Position	Type	Severity	Extent	Incidence

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

#### IDENTIFICATION DETAILS

Date:	Examined by:	Cult. No.:	Herbarium No.:		
Confidence	Effect	Type	Identification	Family	Retained
1. _____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

#### CODES

SITE TYPE	HOST TREATMENT	INSPECTION TYPE	TERRAIN	POSITION	DISORDER TYPE	EXTENT
Exotic Planting	Clearfelled	Blitz survey	Flat	Bark	Animal	Clustered
Individual Exotic	Established	DOC	Gully	Branches	Chemical	Isolated
Individual Native	Pruned/Followers	Exotic Forest Survey (FOA)	Ridge	Buds	Fire	Localized
Native Forest	Pruned	Exotic Forest Survey (Non FOA)	SLope	Cambium	Fungal	Scattered
Native Planting	Pruned & Thinned	Forest Small Blocks	Undulating	Debris	Insect	Widespread
Nursery	Regeneration	Other Indigenous		ENire tree	Mechanical	
Other	Thinned	Other Commercial		Foliage	Mortality	
Regeneration	Untended	Public Enquiries		Litter	Nutritional	
SHelterbelt		Risk Site survey		ROuts	Other abiotic	
I/Rhan		Special Survey		Root Collar	Root Damage	
		Specific Pest Response		SEed	Water	
				STEM	WEather	
				Terminal		
				WOod		

Form

For full details of Data Base requirements see Appendix One

## SECTION 7: REFERENCE TO FOREST INSECTS AND DISEASES

Leaflet  
Number

### Nematode

Neotylenchidae

*Deladenus siricidicola*

Parasite of Sirex

### Mites

Tetranychidae

\**Oligonychus hondoensis*

Spruce mite

\**Oligonychus ununguis*

Spruce mite

**Entomological** Common names are not always forestry orientated but insects have had forestry association.

### Orthoptera

Stenopelmatidae

*Hemideina thoracica*

Bush weta

Gryllidae

\**Teleogryllus commodus*

Black field cricket

Tettigoniidae

*Caedicia simplex*

Katydid

### Phasmida

Phasmatidae

*Clitarchus* spp

Stick insects

### Isoptera

Kalotermitidae

\**Glyptotermes brevicornis*

Termite ex Australia

\**Kalotermes banksiae*

Termite ex Australia

*Kalotermes brouni*

Native dry-wood termite

59

Termopsidae

*Stolotermes inopinus*

Native wetwood termite

*Stolotermes ruficeps*

Native wetwood termite

60

Rhinotermitidae

\**Coptotermes acinaciformis*

Australian subterranean

62

\**Coptotermes frenchi*

Australian subterranean

62

### Hemiptera

Flatidae

\**Sephenia cinerea*

Grey planthopper

\**Siphanta acuta*

Green planthopper

Ricaniidae

\**Scolypopa australis*

Passionvine hopper

Adelgidae

\**Adelges nordmannianae*

Fir adelgid, sapsucker

52

\**Pineus laevis*

Pine Woolly aphid

25

Aphididea

\**Aphis gossypii*

Melon aphid

\**Aphis nerii*

Oleander aphid

\**Aulacorthium circumflexum*

Lily aphid

\**Aulacorthium solani*

Foxglove aphid

\**Betulaaphis quadrituberculata*

Silver birch aphid

*Brachycaudus helichrysi	Leafcurl plum aphid	
*Carariella aegodii	Carrot aphid	
*Cinara juniperina	Conifer aphid	
*Cinara pilicornis	A Spruce aphid	
*Elatobium abietinum	Spruce aphid	54
*Eulachnus brevipilosus	Pine aphid	55
*Macrosiphum euphorbiae	Potatoe aphid	
*Myzocallis castanicola	Sweet chestnut aphid	
*Myzocallis coryli	Hazel aphid	
*Myzus persicae	Green peach aphid	
*Ovatus crataegarius	Mint aphid	
*Phyllaphis fagi	Copper beech aphid	
*Pterocallis alni	Alder aphid	
*Rhopalosiphum nymphaeae	Sapsucker	
*Toxoptera aurantii	Black citrus aphid	
*Toxoptera citricidus	Brown citrus aphid	
Callaphididae		
*Tuberculatus annulatus	Sapsucker	
Pemphigidae		
*Eriosoma laninosum	Pear root aphid	
*Pemphigus bursarius	Poplar gall aphid	
Cicadidae		
Amphipsalta cingulata	Clapping cicada	44
Amphisalta strepitans	Chirping cicada	44
Amphisalta zelandica	Chorus cicada	44
Psyllidae		
*Blastopsylla occidentalis	Sapsucker	
*Ctenarytaina eucalypti	Blue-gum psyllid	53
*Glycaspis granulata	Sapsucker producing lerp	
*Psylla acacia	Sapsucker	
*Psylla acaciaebaileyana	Sapsucker	
*Psylla albizziae	Sapsucker	
*Psylla conspiciua	Sapsucker	
*Psylla exquisita	Sapsucker	
*Psylla juncunda	Sapsucker	
*Psylla uncatoides	Sapsucker	
Margarodidae		
*Icerya purchasi	Cottony cushion scale	
Ultracoelostroma assimile	Sootybeech scale	
Pseudococcidae		
*Balanococcus diminutus	Sapsucker	
*Nipaecoccus aurilantus	Golden mealy bug	
*Pseudococcus affinis	Sapsucker	
*Pseudococcus longispinus	Longtailed mealy bug	
Coccidae		
*Ceroplastes sinensis	Chinese wax scale	
*Coccus hesperidum	Brown soft scale	
Inglisia fagi	Scale on red beech	
*Pulvinaria camelicola	Sapsucker	
*Saissetia coffeae	Hemispherical scale	
*Saissetia olea	Black scale	
Eriococcidae		
*Eriococcus araucariae	Felted pine scale	
*Eriococcus coriaceus	Gum-tree scale	22
*Eriococcus leptospermi	Felted manuka scale	
*Eriococcus orariensis	Manuka blight scale	23

<b>Diaspididae</b>		
*Aspidiotus nerii	Oleander scale	
*Asterolecanium quercicola	Golden oak scale	
*Carulaspis juniperi	Juniper scale	
*Hemiberlesia rapax	Greedy scale	
*Lepidosaphes eucalypti	Eucalyptus mussel scale	
*Lepidosaphes multipora	Sapsucker	
*Lepidosaphes ulmi	Elm scale	
*Lindingaspis rossi	Ross black scale	
Parlatoria pittospori	Mauve pittosporum scale	
Phenacaspis eugeniae	Warataha scale	
*Quadraspidotus ostreaeformis	Oystershell scale	
*Quadraspidotus perniciosus	San Jose scale	
*Trillifiorinia acaciae	Sapsucker	
<b>Pentatomidae</b>		
Cermatulus nasalis	Predatory Lep larvae	
Oechalia schellebergi	Predatory lep larvae	
Oncacantias vittatus	Sapsucker	
<b>Cicadellidae</b>		
*Batracomorphus angustatus	Sapsucker	
*Edwardsiana crataegi	Sapsucker	
*Idiocerus decimaquartus	Sapsucker	
*Idiocerus distinguendus	Sapsucker	
<b>Thysanoptera</b>		
<b>Thripidae</b>		
*Heliothrips haemorrhoidalis	Greenhouse thrips	24
*Hoplothrips corticus	Sapsucker	
*Teuchothrips disjunctus	Bottlebrush thrips	
*Thrips australis	Sapsucker	
*Thrips tabaci	Onion thrips	
<b>Lepidoptera</b>		
<b>Hepialidae</b>		
Aenetus virescens	Puriri Moth	16
Wiseana supp.	Porina	
<b>Oecophoridae</b>		
Barea confusella	Wood borer	
Barea exarcha	Wood borer	
Izatha spp.		
<b>Tineidae</b>		
Heliostibes atychioides	Gregarious tineid	41
*Opogona comptella	Bark borer	
*Opogona omoscopa	Bark borer	
<b>Oecophoridae</b>		
Proteodes carnifex	Mountain beech moth	61
<b>Gracillariidae</b>		
Acrocerope alysidota	Defoliator	
Phyllonorycter messaniella	Oak leaf-miner	
<b>Tortricidae</b>		
Ctenopseustis obliquana	Brownheaded leafroller	40
Epichorista emphanes	Beech leafroller	
*Epiphyas postvittana	Light brown apple moth	58
Harmologa oblongana		
*Penthina doxasticana	Acacia	
Planotortrix excessana	Greenheaded leafroller	58



Planotortrix notophaea	Blacklegged leafroller	58
Pyrgotis plagiatana		
*Strepsicrates macropetana	Eucalyptus leafroller	57
<b>Pyalidae</b>		
Uresiphita Polygonalis maorialis	Kowhai moth	42
<b>Saturnidae</b>		
*Hyalophora cecropia	Cecropia moth	
*Opodiphthera eucalypti	Gum Emperor moth	7
*Samia cynthia	Ailanthus moth	
<b>Psychidae</b>		
Liothula omnivora	Bag moth	51
<b>Noctuidae</b>		
Agrotis ipsilon	Greasy cutworm	
Chrysodeixus erisoma		
*Dasypodia cymatoides	Defoliator	
*Dasypodia selenophora	Defoliator	
Euxoa admirationis		
Graphania spp.		
*Heicoverpa armiger conferta	Tomato fruitwork	9
*Leucania seperata	Cosmopolitan armyworm	
Rictonis comma		
<b>Geometridae</b>		
Declana floccosa	Forest semilooper	50
Declana hermione		
Declana junctilinea		
Declana leptomera		
Gellonia dejectaria		
Pseudocoremia fenerata	Native looper	56
Pseudocoremia leucelaea		
Pseudocoremia productata		
Pseudocoremia suavis	Native looper	11
*Zermizinga indocilisaria	Lucerne looper	
<b>Diptera</b>		
<b>Cecidomyiidae</b>		
*Dasineura mali	Apple leafcurling midge	
Proterodiplosis radialis	Rata root gall midge	46
<b>Stratiomyidae</b>		
*Inopus rubriceps	Australian sldier fly	
<b>Hymenoptera</b>		
<b>Siricidae</b>		
*Sirex noctillio	Sirex wood wasp	20
<b>Ichneumonidae</b>		
*Megarhyssa nortoni nortoni	Sirex larval parasite	47
*Rhyssa lineolata	Sirex larval parasite	47
*Rhyssa p. persuasoria	Sirex larval parasite	47
<b>Braconidae</b>		
*Bracon phylacteophagus	Eucalypt sawfly parasite	
<b>Ibaliidae</b>		
*Ibalia leucospoides ensiger	Sirex egg parasite	47
*Ibalia l. leucospoides	Sirex egg parasite	47
<b>Orussidae</b>		
Guiglia schauinslandi	Native parasite of Sirex	47
<b>Pergidae</b>		

*Phylacteophaga froggatti	Eucalyptus sawfly	64
Chalcidoidea		
*Megastigmus spermotrophus	Seed chalcid Douglas fir	14
*Pleistodontes imperialis	Seed feeder	
Tenthredindae		
*Caliroa cerasi	Cherryslug	
Eulophidae		
*Eulophid sp.	Sapsucker	
*Flockiella sp.	Sapsucker	
*Ophelimus spp.	Eucalyptus gall eulophids	
*Rhicnopeltella eucalypti	Blue-gum chalcid	15
Pteromalidae		
*Enoggera nassau	Paropsis egg parasite	
Vespidae		
*Polistes chinensis	Oriental Paper wasp	
*Polistes tasmaniensis	Australian Paper wasp	
*Vespula germanica	European wasp	
*Vespula vulgaris	Common Wasp	
<b>Coleoptera</b>		
Lyctidae		
*Lyctus brunneus	Powder-post beetle	33
Coccinellidae		
*Adalia bipunctata	Twospotted ladybird	
*Cleobora mellyi	Predator of Paropsis	
Coccinella leonina	Orangespotted ladybird	
Coccinella semipunctata	Sevenspotted ladybird	
Coccinella undecimpunctata	Eleven-spotted ladybird	
Dermestidae		
Dermestes maculata	Hide beetle	
Cleridae		
*Thanasimus formicarius	Predator of Hylastes	
Anobiidae		
*Anobium punctatum	Hoseborer	32
*Derophtinus granicollis	Woodborer from Australia	
*Ernobius mollis	Pine knot borer	17
*Hadrobregmus australiensis	Woodborer	1
Hadrobregmus magnus	Native woodborer	
Leanobium flavomaculatum	A native house borer	36
Buprestidae		
*Nasciodies enysi	Beech buprestid	
Lucanidae		
*Rhyssonotua nebulosus	Wood borer	
*Syndesus cornutus	Wood borer	
Scarabaeidae		
Costelytra zealandica	Grass grub	43
*Heteronychus arator	Black Beetle	
Odontria spp.	Brown chafers	43
Pyronota festiva	Manuka beetle	43
Stethaspis spp.	Large green chafers	43
Cerambycidae Agapanthida Pulchella		
Ambeodontis tristis	Two-toothed longhorn	26
*Aridaeus thoracicus	Longhorn from Australia	
*Arhopalus tristis	Burnt pine longhorn	27
*Behtelium signiferum	A Wattle longhorn	
Blosyropus spinosus	Spiny longhorn	

* <i>Callidiopsis scutellaris</i>	A Eucalyptus Longhorn	
* <i>Coptocercus rubripes</i>	Woodbores	
* <i>Didymocantha obliqua</i>	Woodborer	
<i>Drotus elegans</i>		
<i>Hexatricha pulverulenta</i>	Squeaking longhorn	28
<i>Hybolasius genalis</i>		
<i>Leptachrous strigipennis</i>		
<i>Navomorpha lineata</i>	A striped longhorn	2
<i>Navomorpha sulcata</i>	A striped longhorn	
<i>Ochrocydus huttoni</i>	Kanuka longhorn	30
<i>Oemona hirta</i>	Lemon-tree borer	31
* <i>Phoracantha semipunctata</i>	A Eucalyptus longhorn	4
<i>Prionoplus reticularis</i>	Huhu	35
<i>Somatidia antarctica</i>		
<i>Stenopates pallidus</i>	Pallid Longhorn	6
* <i>Tessaromma undatum</i>	Velvet eucalypt longhorn	
<i>Tetrorea</i> spp		
<i>Xylotoles</i> spp	Native longhorns	
<i>Zorion minutum</i>	Flower longhorn	
<b>Chrysomelidae</b>		
<i>Atrichmatus aeneicollis</i>	Leaf beetle	
<i>Eucolaspis brunnea</i>	Bronze beetle	49
* <i>Ocrosophis subfasciatus</i>	Defoliator	
* <i>Paropsis charybdis</i>	Eucalypt tortoise beetle	10
* <i>Pyrgoides</i> sp	Defoliator	
* <i>Trachymela sloanei</i>	Eucalypt Tortoise beetle	
<b>Scolytidae</b>		
* <i>Amasa truncata</i>	Pinhole borer	21
* <i>Cryphalus walperi</i>	Barkborer	
* <i>Hylastes ater</i>	Black pine bark beetle	29
* <i>Hylurgus ligniperda</i>	Golden haired bark beetle	18
<i>Hypocryphalus</i> spp	Native scolytids	
<i>Pachycotes peregrinus</i>	Native, woodborer	19
* <i>Phloesinus cupressi</i>	Cypress bark beetle	3
* <i>Scolytus multistriatus</i>	Elm bark beetle	
* <i>Xyleborinus eucalypticus</i>	Pinhole borer	
* <i>Xyleborinus saxeseni</i>	Pinhole borer	39
* <i>Xyleborus compressus</i>	Pinhole borer	
* <i>Xyleborus solidus</i>	Pinhole borer	
<b>Platypodidae</b>		
<i>Platypus apicalis</i>	Native pinhole borer	37
<i>Platypus caviceps</i>	Native pinhole borer	37
<i>Platypus gracilis</i>	Native pinhole borer	37
<b>Curculionidae</b>		
<i>Anogotus helmsi</i>	Helms beech weevil	
* <i>Asynonychus cervinus</i>	Fullers rose weevil	
* <i>Apion ulicis</i>	Gorse Weevil	
<i>Cecyropa</i> spp	Sand weevils	
<i>Crisius binotatus</i>		
* <i>Desiantha diversipes lineata</i>	Victoria weevil	12
* <i>Dryophthorus</i> sp	Woodborer	
* <i>Gonipterous scutellatus</i>	Gum-tree defoliator	8
* <i>Graphognathus leucolma</i>	White-fringed weevil	13
* <i>Mestites pallidipennis</i>	Woodborer	
<i>Mitrastethus baridioides</i>	Longnosed kauri weevil	34
* <i>Neolaemosaccus narinus</i>	Woodborer	

* <i>Otiorhynchus ovatus</i>	Root feeder
* <i>Otiorhynchus rugostriatus</i>	Root feeder
* <i>Otiorhynchus sulcatus</i>	Black vine weevil
<i>Phloeophagosoma thoracicum</i>	
* <i>Phlyctinus callosus</i>	Root feeder
<i>Phrynixus terreus</i>	
* <i>Pselactus spadix</i>	Woodborer
<i>Psepholax</i> spp	Pit weevils
<i>Rhyncodes ursus</i>	Elephant weevil
* <i>Stenocelis hylastoides</i>	Woodborer
* <i>Steriphus diversipes lineata</i>	Root feeder
<i>Totostoma apicale</i>	Woodborer

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## Pathological

<i>Aecidium milleri</i>	Wineberry rust	14
<i>Aecidium myopori</i>	Ngaio rust	14
<i>Aecidium otagense</i>	Clematus	14
<i>Agrobacterium tumefaciens</i>	Bacterial gall - many hosts	
<i>Agrocybe cylindracea</i>	Heart rot	17
<i>Amanita muscaria</i>	Orange-capped mushroom	
<i>Amylostereum areolatum</i>	Sirex symbiont	17
<i>Armillaria limonea</i>	Root rot	4, 17
<i>Armillaria novae-zelandiae</i>	Root rot	4, 17
<i>Armillaria hinulea</i>	Root rot	
<i>Aulographina eucalypti</i>	Leafspot of eucalypts	1
<i>Auricularia polytricha</i>	Branch decay	17
<i>Bondarzewia berkeleyi</i>	White butt rot	17
<i>Botrytis cinerea</i>	Grey mould	16
<i>Caema peltatum</i>	Phyllocladus rust	14
<i>Capnodium walteri</i>	Sooty mould on <i>Leptospermum</i>	
<i>Cephaleuros virescens</i>	Algal leafspot	12
<i>Ceratocystis piceaperda</i>	Blue stain of Pinus	
<i>Cercospora aristoteliae</i>	Leaf spot	12
<i>Cercospora eucalypti</i>	Leafspot of eucalypts	1, 16
<i>Chondrostereum purpureum</i>	Silver leaf disease	17
<i>Colletotrichum acutatum</i>	Terminal crook	16
<i>Colletotrichum gloeosporoides</i>	Lupin dieback	
<i>Coltricia aureofulva</i>	White pocket rot	17
<i>Coltricia laeta</i>	<i>Elaeocarpus dentus</i> decay	17
<i>Corynelia tropica</i>	Totara needle fungus	12
<i>Coryneum cardinale</i>	Cypress canker	8, 16
<i>Cyclaneusma minus</i>	Needle cast of pines	11
<i>Cyclaneusma niveum</i>	Needle cast of pines	11
<i>Cylindrocarpon</i> spp.	Rootrot of seedlings	
<i>Cylindrocladium scoparium</i>	Rootrot of seedlings	16
<i>Cyclomyces tabacinus</i>	Yellow pocket heart rot	17
<i>Cyttaria gunnii</i>	Galls on <i>Nothofagus menziesii</i>	9
<i>Cyttaria nigra</i>	Galls on <i>Nothofagus menziesii</i>	9
<i>Cyttaria pallida</i>	Galls on <i>Nothofagus menziesii</i>	9
<i>Diplochorella melicyti</i>	Leaf spot	12
<i>Diplodia pinea</i>	Dieback - woundpathogen, pines	7, 16
<i>Dothistroma pini</i>	Needle blight of pines	5, 16
<i>Fomitopsis hemitephra</i>	White heart rot	17
<i>Fomitopsis tasmanica</i>	White heart rot	17
<i>Fusarium</i> spp.	Root pathogen of seedlings	16
<i>Fusarium circinatum</i>	Pitch canker	

<i>Ganoderma applanatum</i>	White rot	17
<i>Ganoderma mastoporum</i>	White rot	17
<i>Grifola colensoi</i>	Nothofagus brown cubical rot	17
<i>Gymnopilus junonius</i>	Live tree stem fungus	17
<i>Hamaspora australis</i>	Rubus rust	14
<i>Hendersonia eucalyptorum</i>	Leafspot of Eucalyptus	1, 16
<i>Heterobasidium annosum</i>	White rot	17
<i>Hymenochaete corticolor</i>	Pocket rot of <i>N. fusca</i>	17
<i>Junghuhnia vineta</i>	Root disease of pines	18, 17
<i>Lophodermium</i> spp.	Needle and leaf fungus	
<i>Marssonina brunnea</i>	Leafspot of poplar	19
<i>Marssonina castagnei</i>	Leafspot of poplar	19
<i>Marssonina salicicola</i>	Leafspot of willow	
<i>Melampsora coleosporioides</i>	Rust of weeping willow	
<i>Melampsora epitea</i>	Rust of willow	
<i>Melampsora larici-populina</i>	Rust of poplar	20
<i>Melampsora medusae</i>	Rust of poplar	20
<i>Melampsoridium betulinum</i>	Rust of birch and alder	
<i>Meloderma desmazierii</i>	Leaf fungus of <i>P. strobus</i>	
<i>Meria laricis</i>	Needle cast of larch	16
<i>Microsphaera alphitoides</i>	Powdery mildew of oak	
<i>Microthyrium eucalypti</i>	Leafspot of eucalypts	1
<i>Monochaetia unicornis</i>	Cypress canker	8, 16
<i>Mycorrhizas</i>	Symbiotic root fungi	
<i>Mycosphaerella coacervata</i>	Leafspot	12
<i>Mycosphaella cryptica</i>	Leafspot of eucalypts	1
<i>Mycosphaerella nubilosa</i>	Leafspot of eucalypts	1
<i>Myriangium duriae</i>	Parasite of manuka scale	
<i>Myriangium thwaitesii</i>	Parasite of manuka scale	
<i>Nectria cinnabarina</i>	Wound pathogen	
<i>Nectria fuckeliana</i>	Flute canker	
<i>Ophiostoma (Ceratocystis) ulmi</i>	Dutch Elm Disease	
<i>Pachysacca</i> sp.	Leafspot of eucalypts	
<i>Peniophora sacrata</i>	GB fungus	3, 17
<i>Pestalotia</i> spp.	Common saprophyte	
<i>Phaeocryptopus gaeumannii</i>	Swiss needle cast disease	2, 16
<i>Phaeolus schweitzii</i>	Cubical rot of <i>Agathis</i>	17
<i>Phaeoseptoria eucalypti</i>	Leafspot of eucalypts	
<i>Phellinus Lloydii</i>	Heartrot of totara	17
<i>Phellinus robustus</i>	Heart rot	17
<i>Phellinus scruposus</i>	White heart rot	17
<i>Phellinus senex</i>	White pocket rot	17
<i>Phellinus wahlbergii</i>	White pocket heart rot	17
<i>Pholiota adiposa</i>	Hoheria heart rot	17
<i>Phomopsis juniperovora</i>	Dieback of cypress	13, 16
<i>Phomopsis pseudotsugae</i>	Shoot dieback and cankering	13
<i>Phomopsis strobili</i>	Dieback and wound pathogen	
<i>Phytophthora cinnamomi</i>	Root rot	16
<i>Phytophthora heveae</i>	Root rot of kauri	
<i>Piptoporus portentosus</i>	Cubical heart rot	17
<i>Placosma nothopanacis</i>	Leaf spot	12
<i>Polyporus catervatus</i>	Pocket rot	17
<i>Poria undata</i>	White pocket rot	17
<i>Pseudomonas syringae</i>	Bacterial infection of pines	10, 16
<i>Pseudomonas</i> s.pv. <i>syringae</i>	Bact. infec poplar, willow, alder	21
<i>Puccinia akiraho</i>	Rust of <i>Oleria</i>	14

<i>Puccinia alboclava</i>	Rust of Clematis	14
<i>Puccinia atkinsonii</i>	Rust of Olearia	14
<i>Puccinia clavata</i>	Rust of Clematis	14
<i>Puccinia coprosmae</i>	Rust of Coprosma	14
<i>Puccinia plagianthi</i>	Rust of Lacebarks & Ribbonwoods	14
<i>Puccinia tiritea</i>	Rust of Muehlenbeckia	14
<i>Pucciniastrum epilobii</i>	Rust of fuchsia	14
<i>Pycnoporus sanguineus</i>	White rot in Knightea excelsa	17
<i>Pythium</i> spp.	Root rot fungi	
<i>Rhizoctonia</i> sp	Root rot of pines	
<i>Rhizoctonia solani</i>	Root rot in nurseries	16
<i>Rhizosphaera kalkhoffii</i>	Saprophytic conifer needle fungus	13
<i>Rosellinia necatrix</i>	Root and butt rot	
<i>Rosellinia radiciperda</i>	Root and butt rot	
<i>Seiridium cardinale</i>	Cypress canker	
<i>Septogloeum ulmi</i>	Leafspot of elm	
<i>Septoria pulcherrima</i>	Leafspot of eucalypts	1
<i>Serpula lacrymans</i>	Dry rot of timber	
<i>Schizophyllum commune</i>	Decay fungus	17
<i>Stereum sanguinolentum</i>	Yellow stringy heart rot	17
<i>Sporothrix</i> sp.	Pathogen associated with Platypus	
<i>Stigmina thujina</i>	Dieback of cypress	
<i>Suillus luteus</i>	Bolete under larch	
<i>Taphrina populina</i>	Leaf curl of poplar	
<i>Thelephora terrestris</i>	Smother and mycorrhizal fungus	16
<i>Trabutia nothofagi</i>	Leafspot of beech	12
<i>Trametes versicolor</i>	Wound parasite	17
<i>Trimmatostroma bifarium</i>	Leafspot of eucalypts	1
<i>Trimmatostroma excentricum</i>	Leafspot of eucalypts	1
<i>Tyromyces guttulatus</i>	Decay in Ilex brexoides	17
<i>Uredo fuchsiae</i>	Rust of Fuchsia	14
<i>Uredo puawhananga</i>	Rust of Clematis	14
<i>Uredo tupare</i>	Rust of Oleria	14
<i>Uromyces edwardsiae</i>	Rust of Sophora	14
<i>Uromycladium acaciae</i>	Rust of acacias	15
<i>Uromycladium maritimum</i>	Leaf rust of A. longifolia	15
<i>Uromycladium notabile</i>	Gall rust of acacia	15
<i>Uromycladium robinsonsonii</i>	Leaf rust of A. melanoxylon	15
<i>Uromycladium simplex</i>	Rust of A.pycnantha	15
<i>Uromycladium tepperianum</i>	Gall rust of acacia	15
<i>Verticillium procera</i>	Blue stain of P.radiata	
<i>Verticillium</i> spp.	Root rot of conifers	6
<i>Xanthomonas juglandis</i>	Bacterial leaf spot	

## SECTION 8: IDENTIFICATION OF INSECTS

### Definitions

Ampullae	Bump like structure
Apical	Apex - tip
Chitin	Hard parts - horny exterior covering of insects
Dorsal Line	A darkened or lightened line directly over the heart on the back of the larva.
Dorsum	The area bounded on each side by the subdorsal band; the back of the larva.
Instar	Stage in larval development between ecdyses.
Lateral Area	The area bounded dorsally by the subdorsal band and ventrally by the lateral band. Includes the spiracles.
Lateral Band	A band extending roughly the same distance as above, but below the spiracles
Mandible	Mouth parts
Papillae	Projection
Pronotum	Back of Prothorax
Prothorax	Front segment of Thorax
Scutellum	Segment of thorax
Seta	Bristle or hair
Spiracle	Breathing hold
Subdorsal Band	A band extending from thoracic segment 2 to abdomen segment 8 or 9 above the spiracles
Thorax	Three segments which bear the wings and legs when present
Tuberculate	Covered with tubercles - protuberances
Venter	The belly of the larvae; that area below the lateral band

### Recognition of Cerambycid Larvae

Apex of mandible with rounded, gauge-like, cutting edge: head deeply embedded in the prothorax, never bearing transverse ridges on either side of the dorso-lateral surface behind the dorsal articulation of the mandible (as in *Prioninae*). Mandible never bearing a tooth dorsally between the base and the apex - **Cerambycinae**.

Apex of mandible ridge on acute or subacute tooth, often with a blunt tooth directed inwards, visible dorsally, between the base and the apex, or cutting edge slanting never rounded and gauge-like = go to **B**.

A transverse ridge present on either side of the dorsal surface of the head extending from near the mid line to behind the base of the antenna. Under side of the head, except for the margin of the mouth frame, not strongly chitinised. Lateral body folds well developed only on abdominal segments 7, 8 and 9 = **Prioninae (HuHu)**.

Transverse ridges on the dorsal surface of the head behind the mouth frame absent. Under surface of head strongly chitinised behind the mouth frame = go to **C**.

Jointed legs well developed; lateral body folds apparent only on abdominal segments 7, 8 and 9; posterior region of pronotum apparently pigmented (fine chitinised points not individually distinguishable with a X10 lens); paired conical projections chitinised apically (urogomphi) present on the 9th abdominal segment near the mid dorsal line; dorsal ampullae not tuberculate, never shining = **Aseminae (Arhopalus)**.

Jointed legs never present; lateral body folds evident on all abdominal segments; posterior region of pronotum not apparently pigmented; sometimes with a single median spine or with a

pair of flattened chitinised buttons dorsally on the 9th segment; dorsal ampullae tuberculate (bubbled), shining = **Laminae (Hexatricha)**.

**NB** The Cerambycinae and the Laminae include most of the indigenous and the long-established exotic Cerambycidae. The Prioninae are represented only by the huhu (*Prionoplus reticularis*), the Aseminae only by the introduction *Arhopalus tristis*. A fifth Subfamily is believed to occur in NZ but larvae have not been reared to the adult stage to establish the identity of the species.

**Recognition of Scolytid, Platypodid, Anobiid Beetles**

<b>Species</b>	<b>Millimeter</b>		<b>Hosts</b>	<b>Habitat</b>	<b>Life Cycle, etc</b>
	<b>Lgth</b>	<b>Wdth</b>			
<i>Hylastes ater</i>	4.0-5.0	1.4	Exotic Softwood	Cambium	Cycle 60-300 days. Swarm flight Sept-Oct, Apr-May
<i>Hylurgus ligniperda</i>	6.0	2.0	Exotic Softwood	Cambium	Cycle summer 10-11 wks. Gallery direction random.
<i>Pachycotes peregrinus</i> *	4.7	2.5	Softwood exot-nat	Wood	Cycle 2 yrs, Tunnels = clay-like frass
<i>Xyleborinus saxeseni</i>	2.5	0.8	Softwood exot-nat	Wood	Brood chamber, Emerge mainly Nov-December
<i>Anaxyleborus truncatus</i>	3.0	1.5	Exotic Softwood	Wood	Brood chambers, Emerge spring-summer
<i>Phloeosinus cupressi</i>	3.0	1.5	Cupressus Twigs	Cambium	Adult cycle 2 per yr twig attack = flagging
<i>Platypus apicalis</i> *	6.5	1.8	Exotic Native	Wood	Cycle 2 yrs. Adult frass strands, larval powdery
<i>Platypus caviceps</i> *	6.5	1.8	Exotic Native	Wood	Cycle +2 yrs adult frass strands, larval powdery
<i>Platypus gracilis</i> *	5.0	0.9	Exotic Native	Wood	Cycle + 2 yrs adult frass stands, larval powdery
<i>Anobium punctatum</i>	2.5-5.0	1.0-1.7	Exotic Native	Wood	Cycle 3-4yrs. Adults November-January
<i>Ernobius mollis</i>	3.0 -6.0	1.0 -2.0	Exotic	Bark Sapwood	Pupae from September Adults October - March



## Recognition of Pentatomid, Shield Bugs - Native

Colour: entirely green (winter Purplish green) = go to 2,  
Colour: never entirely green = go to 4

Length: 4 - 6 mm, prothorax shoulders projecting as sharp cones = **Cuspicona simplex**  
Length: over 10mm, shoulders not sharply projecting = go to 3.

3 white or pale spots on scutellum base = **Nezara viridula**  
No white spots on scutellum base = **Glaucias amyoti**

Shoulder sharp thorn, scutellum yellow, body slender = **Oechalia schellebergi**  
Prothorax shoulder without thorn, body squat = go to 5

Colour: uniform rusty red, black marks on abdomen margin = **Dictyotus naenosus**  
Colour: variegated, never uniform = go to 6

Scutellum with apex spatulate, spine on abdomen between legs = **Oncacantias vittatus**  
Scutellum with simple apex ventral spine undeveloped = go to 7

Scutellum apex yellow, prothorax margin indistinctly pale = **Cermatulus nasalis**  
Scutellum apex dark, prothorax margin pale cream = **Antestia orbona**

## Recognition of Lepidopterous Larvae

**Pseudocoremia suavis** -2 pair prolegs, Native  
Two generations per year but overlapping.  
Epidemics on *P.radiata* and *Ps.menziesii*.

Instar 1	2-5mm, Head light brown, rounded, Body green-yellow, 2 dark subdorsal bands
Instar 2	5-8mm, Head red brown, rounded 2 grey spots on dorsum segment 5.
Instar 3	8-14mm, Head red brown, rounded, 4 pair spots on dorsum segments 2-5.
Instar 4	14-20mm. Head red brown or dappled, square, 4 pair distinct spots on dorsum, Setae and papillae
Instar 5	20-30mm, red brown - brown or grey, Lateral white setae, Abdomen with papillae.

**Pseudocoremia fenerata** - 2 pair prolegs, Native  
Probably 2 generations per year.  
Associated with *P.suavis* epidemics.

Instar 1	2-5mm, Head light brown or green, Body green, Dark subdorsal bands
Instar 2	5-8mm, Head light brown or green, body dark green, Subdorsal bands faint.
Instar 3	8-14mm, Head green, Body dark green
Instar 4	4th = 14-20mm, 5th = 20-27mm, Head green, Body & 5. dark green, lateral white stripe, red dots on spiracles, setae dark, venter often whitish.

**Declana floccosa** - 2 pair prolegs + 1 pair develops, Native  
probably 2 generations per year.  
Associated with *P.suavis* epidemics.

Instar 1	2-6mm, Head brown, rounded, Body slim and banded appearance
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Instar 2	6-9mm, Head brown, rounded, Body with dark subdorsal line, 3rd pair prolegs small.
Instar 3	Head brown, Body with dark subdorsal line, simple papillae, 3rd pair prolegs functional.
Instar 4	Head greyish or brown, body pattern becoming ornate, papillae branched, 3 pair prolegs.
Instar 5	Head greyish, Body ornate and can be range of colours, papillae long and branched

### **Tortrix spp** - Bellshaped wing outline of moth

Larva has 3 pair thoracic legs and 5 pair of prolegs, Head capsule and prothorax usually darker than rest of body. Head rounded and flattened. Larvae usually live concealed in rolled or webbed leaves, in stems and flowers. larvae rather elongate and slightly hairy.

*Ctenopseustis obliquana* - Brownheaded leafroller Fifth instar larva 20mm. Head shiny dark brown. body translucent green. Caterpillar wriggles rapidly if disturbed.

**Epiphyas postvittana** - Light brown apple moth Head fawn coloured streaked with brown. Body olive green with dark green stripes along centre of back and sides.

**Planotoritrix excessana** - Greenheaded leafroller Pale green head, an opaque, pale green body, legs same colour as body.

**Planotortrix notophaea** - Blacklegged leafroller Head green with brown or black streaks. Body bright green with dark strip along back and yellow or pale green stripe along sides. Legs blackened.

**Strepsicrates macropetana** - Eucalyptus leafroller 8-10mm, Head pale brown or irregularly black. Body pale grey - greenish brown with pale line along sides. U shaped mark on last abdominal segment.

### **heliostibes atychioides** - Gregarious Tineid

Mature larvae are about 15mm. Head is brown with black markings. The body is brown - light brown with a white stripe along the back. Larvae construct a nest of chewed foliage material. Nests vary in size depending on the number of larvae.

### **Proteodes carnifex** - mountain beech moth

One generation per year. Adults flying daytime: Nelson 1-1370 metres, February - mid March; Fiordland 150-300m, mid December - mid January.

Larvae have 3 pair thoracic legs and 5 pair prolegs. Larva tapers towards rear. Head yellowish brown or yellowish green. Body pale whitish green or yellowish green with stripe along middle of back. Larvae shelter in webbed leaves etc. can cause widespread and severe defoliation of mountain beech in South Island usually lasting two seasons.

### **Identification of Conifers**

Species	Number Needle	(cm) Length	Cone Length	Cone Colour	Other Features
<i>Pinus nigra</i> (Corsican)	2	10-15	5	Tawny yellow	

Species	Number Needle	(cm) Length	Cone Length	Cone Colour	Other Features
Pinus contorta (Logepole)	2	2.5-6	6	Brown	
Pinus muricata (Bishop)	2	7.5-15	5-7.5	Prickly in 2-3s	
Pinus pinaster (Maritime)	2	13-15	7.5-18	Shining brown	
Pinus carabea (Slash)	3	20-30	10-13	Rounded	
Pinus echinata (Short leaf)	3	7.5-13	5	Clusters	
Pinus paulustris	3	23-40	15-25 colour	Dull	(Long Leaf)
Pinus ponderosa (Western Yellow)	3	13-25	7.5-20		
Pinus taeda (Lobially)	3	15-23	7.5-13	Spines Scales	
Pinus patula (Mexican)	3,4,5	15-23	7.5-10	Pale Brown	
Pinus radiata (Monterey)	3,4,5	10-15	7.5-15	Whorls	
Pinus strobus (Weymouth)	5	7.5-13	10-15	Pendlous	
Larix decidua (European)	1	>3	2.5-4	Conical	Cone scale flat Twigs straw colour
Larix leptolepis (Japanese)	1	>3	2.5	Globose	Scales re-curved Twigs red colour
Pseutosuga menziesii (Douglas)	1	2-3	7.5-10	Pendent	
Picea abies (Norway)	1	1.5-2.5	10-15	Pendulus	
Picea Sitchensis (Sitka)	1	1.5-2.5	5-10		Needles very sharp pointed
Cupressus lawsoniana (Lawson)	Scale	leaf	4	Globose	Pendent leader Cones 8 scales

## Nutrition

### Foliage Analysis Values for P.radiata Nutrient Status

Nutrient	Low Less than	Marginal	Satisfactory More than:	Confidence Rating
	%	%	%	
Nitrogen (N)	1.2	1.2-1.5	1.5	**
Phosphorus (P)	0.12	0.12-0.14	0.14	***
Potassium (K)	0.30	0.30-0.50	0.50	*
Calcium (Ca)	0.10	0.10	0.10	*
Magnesium (Mg)	0.07	0.07-0.10	0.10	**
	<u>ppm</u>	<u>ppm</u>	<u>ppm</u>	
Boron (B)	8	8-12	12	**
Copper (Cu)	2	2-4	4	**
Zinc (Zn)	10	10-20	20	*
Manganese (Mn)	10	10-20?	20?	*

\*\*\* Good prediction of responsive sites in both the low and marginal range.

\*\* Good prediction of responsive sites in the low range but not in the marginal range.

\* Insufficient information and experience to confidently predict a response even in the low range.

### Foliage Sampling to Test Nutritional Levels in P.radiata

When:	February-March for fertiliser recommendations. Deficiency identification any time of year.
From Where:	Second order branches, top third of crown
Foliage Type:	Last to have reached mature length
How Much:	A good handful from several trees
Number of Trees:	At least 10, ideally 15-20 trees.

### Nutrient Deficiencies in Radiata Pine

	<u>Symptoms</u>	<u>Likely Locations</u>
Nitrogen (N)	Short needles, yellowish green to yellow whole length. Light branching.	Sandy & peat soils. Skid sites. Between windrows.
Phosphorus (P)	Short current needles & yellow tips. Fused needles. Poor needle retention. Light branch.	Gumlands, podsolised sands, clays, pakihi. Shallow hill soils.
Potassium (K)	Yellow needle tips in mid-lower crown. Symptom evident late winter.	Mineral belt, Pakihi podzolised sands. Where N/P fertilised.

	<b><u>Symptoms</u></b>	<b><u>Likely Locations</u></b>
Magnesium (Mg)	Gold-yellow needle tips upper crown. Symptoms early summer. Similar to Cyclaneusma.	Pumice soils & parts Nelson & Westland.
Boron (B)	Shoot bud dieback mid-late summer, particularly drought years. Dieback and malformation ongoing	Nelson, Marlborough, Canterbury, Otago, Westland and Pumice
Copper (Cu)	Twisted branches-leader and horizontal branches.	Coastal Northland, Pakihi. Where N/P has been applied.
Zinc (Zn)	Stunted growth. Bronze foliage, Rosette buds, retarded leaders.	Cape Karikari near Kaitaia
Manganese (Mn)	V. pale yellow needles. Particularly spring.	Limestone outcrops, erosion areas.

## Herbicide Damage

### Categories

<b>Symptoms</b>	<b>Cause</b>
Bleaching of chlorosis, e.g. white or very yellow foliage.	Chlorophyll inhibiting or destroying herbicides: Aminotriazole, Amitrole
Cell division inhibiting herbicides (mitosis), e.g. stunted, thickened, dark blue green leaves.	Carbamates
Blockage of photosyntheses. Leaf tip chlorosis and dieback	Substituted urea's and triazines: simazine, atrazine
Growth regulating, distortion of shoots, needles and leaves. Tissue proliferation. Slow acting.	Hormone herbicides, e.g. Phenoxy herbicides i.e. 2,4-D, Benzoic acid, i.e. dicamba, Picolinic acid i.e. Tordon
Rapid brown-off of sprayed foliage. Variety of modes of action. Little translocation. Rapid action.	Contact herbicides e.g. Diquat, ammate, TCA, PCP, Roundup

## **Associated Factors**

Many mechanisms are involved in the injury or death of plants by herbicides. Although herbicides can be grouped broadly by symptoms, these can vary depending on a number of factors, e.g.

1. Woody or herbaceous, broadleaves and conifers can respond differently.
2. Growth stage, age, active or dormant.
3. Climate during and since application.
4. Dosage rates and dosage received.
5. Interaction with other herbicides in a mixture.
6. Additives e.g. oil and surfactants.
7. Herbicide and spray formulation i.e. esters, amines.
8. Nutrition level of plant, herbicides can induce symptoms of nutrient deficiency.

## SECTION 9: GLOSSARY OF TERMS

Aeciospore	One of several kinds of spores produced by a rust fungus. Formed in and released from a fruiting structure called aecium.
Abdomen	The hindmost of three main insect body parts.
Abscission Layer	A layer of specialised cells formed at the base of a twig, before that leaf or twig is shed.
Acervulus	An erumpent cushion like mass of hyphae, bearing conidia.
Agar	A substance from certain red algae used to make culture media into gels upon which micro-organisms are grown
Ampullae	Bump like structure on insects.
Annulus	A ring like partial veil around the stem of a fruiting body after expansion of the pileus.
Antennae	A pair of joined structures on the insect head, seat of sense organs of smell, touch.
Anther	The pollen bearing part of a stamen.
Anthracnose	A type of plant disease which typically is a leaf and twig blight. Common on hardwoods.
Anus	The posterior opening of the gut.
Anthropods	Jointed-legged or articulated animals e.g. spiders - insects.
Apical	Apex - tip.
Ascospores	A spore produced in an ascus.
Asexual Stage	A stage in the life cycle of a fungus in which spores are produced without previous sexual fusion' also called imperfect stage.
Axil	The angle between the stem and the upper surface of a leaf or other organ.
Basidiospore	The spore produced by the sexual stage of Basidiomycetes.
Blight	A loose term for disease causing rapid dieback.
Biota	The fauna and flora of a given region.
Bract	A leaf on a main flower stalk generally a little different from the other leaves, from whose axil a flower or its stalk often springs.
Brown rot	Decay caused by fungus that attacks cellulose rather than lignin, leaving a brownish residue.
Calyx	A cup formed of the outer row of the flower leaves joined together
Cambium	The thin layer, meristematic cells between bark and wood which, by cell division forms new bark and wood cells
Canker	A definite relatively localised necrotic lesion primarily of the bark and cambium.
Capsule	A dry fruit containing two or more seeds.
Cerci	Insect tail filaments which often function as sense organs.
Checks	Separation of wood cells along the grain as a result of uneven shrinkage.
Chitin	Hard parts - horny exterior covering insects.
Chlorosis	An abnormal yellowing of the foliage.
Cladode	A branch looking like and doing the work of a leaf
Classification	Of organisms; the smallest group is the species which are grouped together in a genus, then families, orders, classes, phyla or divisions.
Clone	Plants derived from one individual by vegetative reproduction and therefore identical.
Compression wood	Abnormal wood formed in leaning trees on lower side
Conidium	An asexual spore

Conk	A type of fruiting structure, often bracket like
Cornicle	Small horn-like tubes on the sides of the back of the abdomen of aphids
Corolla	Petals as a whole
Coxa	The first segment of the leg which is attached to the thorax.
Cuticle	The outer covering of an insect which is laid down the epidermis
Cultivar	An assemblage of cultivated individuals distinguished by any useful, reproducible character
Culture	A growth of an organism under artificial conditions
Cutting	Detached portion of stem or other plant part which when rooted, produces a whole plant
Damping Off	Rotting of seedlings before or soon after emergence, often at soil level
Decay	The decomposition of plant tissue by fungi and other micro-organisms
Defoliation	Loss of current year's or past years foliage
Dewpoint	The temperature at which atmospheric water vapour condenses out as liquid
Dieback	The death of parts of a tree or plant usually from the top down
Disease Cycle	The chain of events in the development of a disease
Difuse Porous Wood	A hardwood in which the pores are of approximately uniform size and are distributed evenly throughout each growth ring
Dorsum	The area bounded on each side by the back on an insect larva
Drupe	A fruit with a soft envelope and a hard seed inside
Dry Rot	Loose term for any dry, crumbly rot where decayed wood can be crushed to a dry powder
Earlywood	The first formed portion of the growth ring often characterised by larger cells and lower density
Ecdysis	The act of moulting a cuticular layer or structure
Elytron	The thick and tough front wing of beetles
Epicormic	Growing from buds on large stem or shoot, which buds did not expand when first laid down on the growing shoot.
Epidemic	Pertaining to a disease or insect population which has built up rapidly and reached injurious levels
Epidermis	The outermost layer of cells on the primary plant body
Epidermis	On insect; single layer of cells which lays down the cuticle.
Epiphyte	A plant that grows on another plant but is not a parasite and produces its own food by photosynthesis
Exudate	Matter which oozes out or is secreted.
Facultative Parasite	An organism which is normally saprophytic but which is capable of living as a parasite only when unfavourable conditions predispose the host so that it is unusually susceptible
Facultative Saprophyte	An organism which is normally parasitic but which is capable of living as a saprophyte
False Rings	Rings in timber, among and look like annual rings but are not complete. May be caused by frost, defoliation, lightning
Fasciation	Coalescent development of the branches of a shoot system
Fascicle Sheath	A sheath around the base of a cluster or bundle of needles
Frass	Refuse of insects which bore holes in wood
Fruiting Body	Any of a number of kinds of reproductive structures which produces spores
Galls	Pronounced swellings on woody plants caused by certain



	insects and diseases
Girdled	The removal or destruction of tissue in a rough ring round a stem, branch or root
Glabrous	Without hairs; not pubescent
Glaucous	Grey-blue or whitish
Gummosis	The giving off of gummy substances as a result of cell degeneration
Halter	The small knobbed organ which is the modified hind-wing of two winged flies
Haustorium	A special hyphal branch for the absorption of food, especially one within a living cell of the host
Heartwood	The central core of wood in mature stems. Cells dead and filled with lignin
Hermaphrodite	Individual with both male and female organs
Host Range	All hosts which a particular pathogen attacks
Host Specific	A term used to describe those pathogens which attack only certain species of hosts
Hypertrophy	Excessive and often abnormal growth due mainly to increase in size of cells
Hypha	One of the threads of a mycelium
Imago	The adult or reproductive stage of an insect
Imperfect Stage	That part of the life cycle of a fungus in which only conidia and no sexual spores are produced
Incipient Decay	An early stage of decay where hyphae have invaded cells but have not perceptibly reduced the hardness of the wood
Infect	To invade and cause a disease
Infection Court	The area in which the pathogen first established itself on or in the host
Inflorescence	Part bearing the flowers - flower head
Inoculation	Transference of an organism into or on to a potential host, in order to test pathogenicity
Inoculum	The spores, mycelium, sclerotia, or other propagules of a pathogen which initially infect a host or crop
Instar	The stage between two successive castings of larval skin
Intercellular	Between the cells
Intracellular	Inside a cell or cells
Latent Infection	An established infection which does not show its presence
Latewood	The portion of the growth ring formed after earlywood, often characterised by smaller cells or higher density
Leaf Spot	A leaf disease characterised by numerous distinct lesions
Lenticel	A pore on a shoot, usually elliptical and white or corky and raised
Lobe	Any round projection especially on a leaf or petal
Mandible	Mouth parts, insects
Metabolism	The total of biochemical changes that go on in the animal body, by which living material is built up and broken down
Metamorphosis	Change in form; the period of rapid transformation from larval to adult form
Mildew	A fungal disease in which the bulk of the mycelium is produced on the surface of the host
Monoecious	Bearing male and female flowers as separate organs but on the same plant
Mushroom	Any of various rapid growing, fleshy fungi that typically have a stalk capped with an umbrella-like top
Mycelium	A mass of hyphae which forms the vegetative filamentous body of a fungus

Mycoplasma	A type of disease causing organism similar to a bacterium but lacking a true cell wall
Necrosis	Death of plant cells usually resulting in darkening of the tissue
Node	The point on a shoot at which a leaf or shoot or whorl arises; nodes are separated by internodes
Nymph	A term applied sometimes to larvae in their later stages when the wing lobes are developed
Obligate parasite	An organism able to exist only as a parasite
Ovipositor	The egg-laying apparatus of an insect
Ovule	A seed germ still attached to the mother leaf or scale
Papillae	Projection on insect larva
Parasite	An organism living on and nourished by another living organism
Parenchyma	Live thin-walled wood cells involved mainly with food storage and distribution
Parthenogenesis	Development of the egg without fertilisation into a new individual
Pathogen	An organism which causes a disease
Pathogenicity	Ability to cause disease
Pectinate	Arranged like the teeth of a comb
Pediculate	Stalked
Perfect Stage	The stage in which the sexual spore stage is produced
Perianth	Petals and sepals together
Petiole	The stalk of a leaf
Pheromone	Chemical substance secreted by animals, used to influence or convey information to other animals
Phloem	The tissue of the inner bark responsible for the transport of elaborate food stuffs
Phytotoxic	Toxic to plants
Pistil	Stalk and stigma together of plant female sex organs
Pith (Medulla)	Small core of soft, spongy tissue located at the centre of tree stems and branches
Pollard	A tree which has been pollarded; cut often repeatedly near the ground
Primary Infection	Infection of a host by primary inoculum
Proboscis	The elongated mouth parts of some insects
Prolegs	The stumpy appendages on the abdomen of caterpillars
Pronotum	Back of prothorax
Prothorax	Most anterior of the three segments which make up the insect thorax
Prosenchyma	Non living wood cells that function in conduction and support
Pustule	A small sometimes coloured, blister like swelling
Pycnidium	The fruit-body of the Sphaeropsidales, frequently globose or flask like
Raceme	Stalked flowers growing up a main flower stalk
Resistant	Able to withstand without serious injury attack by an organism or damage by a non living agency but not immune from such attacks
Rhizomorph	A thick strand of vegetative hyphae in which the hyphae have lost their individuality
Ring-porous Wood	Hardwood having relatively large pores concentrated in earlywood and smaller pores in latewood
Rostrum	The beak-like mouth parts of the bugs
Saddled	Leaves astride the lower ones in flax
Saprophyte	An organism using dead organic material as food

Sapwood	Physiologically active wood comprising one too many outermost growth rings lighter in colour than heartwood
Scion	The shoot used in grafting which is put on the root stock to make the new tree
Sclerotin	The horny substance of insect cuticle
Sclerotium	A firm frequently rounded often black mass of hyphae; often acting as a resting body
Scutellum	Segment of thorax
Sepal	A leaf of the calyx, the outer row of the flower leaves, often green
Septum	A wall or division
Sessile	Without a stalk
Seta	Bristle or hair on insect
Softwood	Wood produced by coniferous trees
Spike of Flowers	Stalkless flowers growing up a main flower stalk
Spiracle	External opening of breathing tube
Spiral Grain	Cross grain indicated by grain deviation
Spore	The reproductive structure of the fungi and other lower plants
Sporulate	To produce and release spores
Stag-headed	With dead branches projecting from the upper crown
Stamen	A male organ in a flower bearing the anthers with pollen
Stigma	That part of the flower which receives the pollen grains and on which they germinate
Stipule	One of a pair of appendages or hangers-on borne at the base of a leaf on many plants
Stomata	A pore in the leaf epidermis, surrounded by two guard cells, leading into an intercellular space within the plant
Stroma	A mass of fungal hyphae packed together to form a hard curst in or on which fruiting bodies are formed
Succulent Shoot	A shoot which is kept rigid mainly by the turgidity of the cell contents
Symptom	The evidence of disturbance in the normal development and function of a host plant
Systemic	Generally present throughout an organism, or able to spread internally through an organism
Tegmen	The hardened leathery forewing in Orthoptera and Homoptera protecting the hind wings
Teliospore	The spore of the rust fungi from which the perfect stage of the basidium and basidiospore arise
Thorax	In insects it is the group of three segments behind the head which bear the legs and wings
Tomentose	With a dense wooly pubescence
Tracheids	Elongated conductive cells comprising over 90% of softwood tissue
Tuberculate	Covered with tubercles - protuberances
Umbel	A very much contracted raceme so that all the flower stalks or rays seem to start from the same spot
Urediospore	One of the many spore stages produced by the rust fungi in their life cycle
Vector	An organism, usually an insect, that transmits a pathogen from one host to another
Venter	The belly of an insect larva
Viviparity	Giving birth to living young
Whiterot	Decay caused by fungi that attack all chief constituents of wood and leave a whitish or light coloured residue
Whorl	An arrangement of three or more organs in a circle around an

Wilt	axis The collapse of those parts of the plant which are sustained by cell turgidity
Witches Broom	A dense conglomeration of twiggy growth, arising from abnormally profuse bud development

## SECTION 10: THE BIOSECURITY ACT 1993 (Reprinted May 1998)

**An act relating to the exclusion, eradication, and effective management of pests and unwanted organisms.**

*NB: These notes and extracts from the Biosecurity Act have been produced for the National Certificate in Forest Health Surveillance training requirements, and do not represent the full content of the Act. Refer to a copy of the Biosecurity Act for full detail.*

### Part I: Interpretation of Terms

Biosecurity Control Area	Part of port approved for first arrival
Chief Technical Officer	Person appointed by Director General with authority to; Appoint Inspectors to enforce the Act. Appoint persons for Pest Management.
Controlled Area:	A declared area to limit; the spread of a pest or unwanted organism, minimise damage, facilitate NZ products to overseas markets, and manage uncleared goods.
Goods:	All kinds of moveable personal property.
Import:	Bring within NZ from outside territory.
Inspector:	Person appointed by Chief Technical Officer with authority to; Enforce and manage requirements of the Act.
Local Authority:	Regional Council or territorial authority.
Minister:	Minister of Agriculture and Forestry.
Ministry:	Ministry of Agriculture and Forestry (MAF).
Occupier:	Person occupying place; including agent, employee, management.
Organism:	Generally; a non human living thing that includes micro-organisms, and any part of a genetic structure.
Person:	Includes the Crown, a corporate sole, and a body of persons (whether corporate or unincorporated).
Pest:	A specific organism.
Pest Management Strategy:	Strategy for management or eradication of a particular pest or pests.
Port:	Airport, Anchorage, Harbour, Wharf.
Quarantine:	Confinement of organisms or organic material that may harbour pests.
Restricted Organism:	For which a permit is required for import, or import is prohibited.
Restricted Place:	Place that an Inspector or authorised person has declared to be restricted place.
Risk Goods:	With which it is reasonable to expect to harbour an unwanted organism.
Unauthorised Goods:	Uncleared during import or export, or restricted within a Biosecurity Control Area.

## **EXTRACTS AND SUMMARIES FOLLOWING ACT NUMBERING**

### **Part II: Functions, Powers, and Duties: Minister and Local Authorities.**

#### **Part III: Importation of Risk Goods**

- 16 The purpose of this part is to provide for the effective management of risks associated with the importation of risk goods e.g.
- 41 Designation of quarantine area:  
The Director General may by notice in the Gazette designate any place to be a quarantine area, and may at any time revoke such a designation.

#### **Part IV: Surveillance and Prevention**

- 42 Purpose of Part IV  
The purpose of this part of the Act is to provide for the continuous monitoring of New Zealand's status in regards to pests and unwanted organisms.
- 43 Duty to provide information.  
An Inspector or authorised person may require the Crown, a corporation, and body of persons (corporate or unincorporated).
- a. To provide any information held by the person concerning pests, pest agents, or unwanted organisms, etc.
  - b. To provide such assistance as the Inspector or authorised person reasonable requests to enable or facilitate the acquisition, collection, and recording of any such information ascertained.  
etc
- 45 Notifiable organism.
2. The Governor General may by Order in Council, declare any organism to be a notifiable organism.
  3. The Governor General may, by Order in Council, made on the recommendation of the responsible Minister, declare any pest to which a regional pest management strategy relates to be an organism notifiable within the region, or within any specified part of the region, of the regional council or regional councils concerned.
- 46 Duty to report notifiable organisms.  
Every person --- shall without reasonable delay report to the chief technical officer its presence or possible presence in that place at that time.
- 47 Power to require information.  
A chief technical officer may, by notice in writing, require the person in charge of premises (and etc) used for investigating organisms to:
- a. information etc,
  - b. access to inspect and test etc.

## **Part V: Pest Management**

- 54 Purpose of Part V  
The purpose of this Part is to provide for the effective management or eradication of pests and unwanted organisms. Powers for purpose of pest management strategy and small-scale management programme.  
The management or eradication of pests must be in accordance with pest management strategies made in accordance with this Part.
- 56 Preparation of national pest management strategy.  
A Minister or any person may prepare a proposal for a national pest management strategy.
- 62 Notification of proposed national pest management strategy.  
The Minister shall publicly notify a proposed national pest management strategy by:  
a. Publishing the notice in the Gazette;  
aa. daily newspapers; and etc
- 63 Board of inquiry.  
The Minister must appoint a board of inquiry to inquire into and report on every proposal for a pest management strategy etc.
- 80a Contents of regional pest management strategy.  
A regional pest management strategy must specify the following matters:  
a. pest(s);  
b. objectives;  
c. management agency;  
d. period in force;  
e. powers to be used; and etc.
- 85 Operational plans.  
The management agency for every pest management strategy shall: i.e. have an operational plan, and review and amend if required annually and etc.
- 86 Compensation.  
Complicated; refer to the Act.
- 96 Resolution of disputes.  
Refer Act. There is a system with appointed arbitrators.

## **Part VI: Administrative Provisions, Appointments and Delegations.**

- 109 Power of inspection.  
An inspector may at any reasonable time or times enter and inspect any place for the purpose of confirming the presence, former presence, or absence of:  
i. pest, pest agent, unwanted organism  
ii. unauthorised goods  
iii. risk goods and etc
- 130 Declaration of restricted place.  
In an inspector or authorised person believes or suspects on reasonable grounds that a pest or unwanted organism is or has been in place, the inspector or authorised person may, by notice --- declare that place and any other place in the neighbourhood the inspector or authorised person considers necessary to be a restricted place.

131 Declaration of controlled area.

The purpose of this section is to enable the institution of movement in other controls in order to:

- a. Limitation of spread;
- b. Minimise damage;
- c. Protect any area from incursion;
- d. Facilitate trade;
- e. Monitor.

131 Road blocks, cordons, check-points.  
Refer to Act on how these are legally introduced.

134 Enforcement of area controls.  
Refer to Act for enforcement powers.

135 Options for cost recovery.  
Refer to act for details, later for methods and means of cost recovery.

## **Part VII: Exigency (emergency) Actions.**

143 The purpose of this part of the Act is to provide for the effective prevention management, or eradication of unwanted organisms if emergencies or other exigencies occur.

144 (1) Declaration of Biosecurity emergency.  
On the recommendation of a Minister, the Governor General may by proclamation, declare a Biosecurity emergency if satisfied on reasonable grounds after having regard to all information that;

- a. that is likely:
  - i. there has been an outbreak or occurrence of an organism;
  - ii. There is established an organism not known to be previously established;
  - iii. An organism thought to be restricted has become distributed and abundant;
  - iv. A pest is, or threatens to be, beyond the control of a pest management strategy.
- b. It is in the public interest that action be taken immediately to i.e. manage – eradicate an organism.

(3) A declaration of a Biosecurity emergency shall state the area or areas to which it applies and specify the nature of the emergency.

(4) A declaration of a Biosecurity emergency comes into force when it is declared or at any later time stipulated in the proclamation declaring it.

145 Emergency powers.  
The Minister may, in the area or areas in which a declaration of Biosecurity emergency is in force, take such measures, and do all such acts and things and give all such directions etc etc, as the Minister believes on reasonable grounds to be necessary etc etc, for the purpose of managing, or eradicating the organism. Refer to Act for further details.

146 Duration of emergency.  
Unless it is sooner revoked or extended by the House of Representatives, a declaration of Biosecurity emergency ceases to have effect on the expiration of four months after it comes into force.

150 Biosecurity emergency regulations.



On the recommendation of the Minister, the Governor General may, at any time while a declaration of Biosecurity emergency is in force, by Order in Council make regulations for the management, or eradication of the organism.

152 Provisional control action.

(1) If a Minister suspects on reasonable grounds that a pest or unwanted organism may be present in New Zealand but is unable to confirm the suspicion until further information is available to enable identification etc, the Minister may by written notice to a chief technical officer declare a provisional control programme.

(3) A provisional control programme declared – may remain in force for a period not exceeding 60 days.

**Part VIII Enforcement, Offences, and Penalties (Refer to Act)**

163 Protection of inspectors and others.

Covering inspector, authorised person, accredited person; protection against civil and criminal liability unless acting in bad faith; refer to Act.

164c Registration of unwanted organisms.

Where a chief technical officer has formed the belief that makes an organism an unwanted organism, that chief technical officer must notify the Director General that the organism is an unwanted organism.

A registrar of unwanted organisms is kept.

**Part IX: Miscellaneous Provisions.**

**Part X: Savings and Transitional Provisions.**

## **Appendix 1: Forest Health Database**

**FOREST HEALTH DATABASE:  
OPERATING PROCEDURE FOR FILLING OUT  
INSPECTION/COLLECTION FORMS**

**L. S. BULMAN**

**DECEMBER 2004**

***FOREST RESEARCH***

**PRIVATE BAG 3020**

**ROTORUA**

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*Appendices*

*Map of biological regions*

## **BACKGROUND**

Forest health information has been collected in New Zealand for many years. In 1956 the Forest Biology Survey was established with early emphasis on monitoring forest insect populations and certain fungal problems. In the late 1960s the emphasis changed from monitoring existing disorders to the early detection of newly introduced pests and diseases. Regular surveys of forests and port environs to detect newly introduced pests and diseases have been carried out since then.

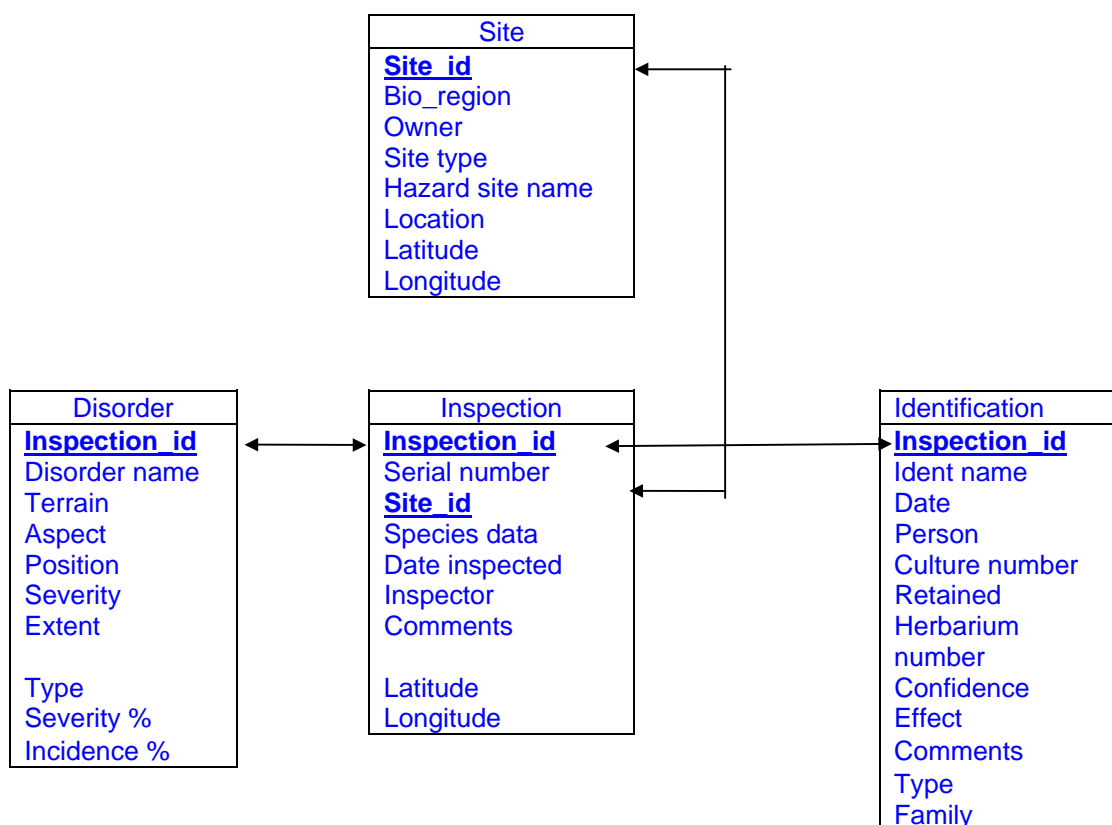
During the early 1980s it was decided to develop a database to store records of forest health inspections and samples received by the Forest Health Group of **Forest Research**. A VAX-based flat database using DATATRIEVE as the data entry and query tool was operational in 1984. The database comprised historical data dating back to 1960. By 1993 it was obvious that DATATRIEVE was becoming obsolete, and the large amount of data stored resulted in very slow query-based searches. A relational database using a SQL-server as the processor and ACCESS for the front end was developed, and in 1994 data from the VAX database was converted and imported to this relational database. In 1997, the database was transferred to a Sybase server.

In the year to 30 June 2004, over 7,700 records of forest health inspections, and collections received by the Forest Health Reference Laboratory, were entered to the forest health database. From samples sent in, over 2,400 identifications of insects, fungi or abiotic disorders were recorded. In addition, 7,700 disorders were recorded and the severity, incidence and extent of damage assessed. The health database as at 30 June 2004 contains records from over 123,000 inspections from 36,000 individual sites; with 42,000 identifications of insects and fungi and 102,000 disorders.

## **PROCEDURES**

The database consists of 4 main tables: Site, Inspection, Disorder, and Identification (see below). The form is set out to follow this design. The following pages describe the forest health inspection/collection form and documents procedures for filling out this form. Mandatory fields are bolded. A map showing the biological regions is appended.

### **Forest Health Database**



## **SITE DETAILS**

Correct site details are crucial to maintain the integrity of the database. Details of each individual site are stored in the site table, and every time an inspection takes place at an individual site the inspection details are linked to that individual record in the site table. This ensures that inspection histories can be extracted for individual sites with confidence that all records will be extracted. If site details are recorded inconsistently, more than one record will be stored in the database to describe the same site which will result in incomplete inspection histories being extracted. For instance, in the old VAX database, one site was described as Kaingaroa Cpt 3, Cpt 3 Kaingaroa Forest, Kang 3, Kaing Cpt 3, etc. This made it almost impossible to extract all the inspection records for that site over the years.

### **OWNER NAME**

This field records the code for the name of the forest owner, woodlot owner, local authority, or (in some cases) a private individual. A list of owners and codes for Forest Health Dynamics will be supplied on request. The forest manager may differ from the forest owner, in this case either manager or owner can be used, as long as the same name is used consistently. For urban addresses use the name of the city as owner name (i.e. AUCK for all inspections or samples collected in Auckland). If necessary, record the property owner's name in the location. Do not use local body names for urban samples, as often local authorities own forests and some confusion could occur, for instance Palmerston North owns Tiritea Forest - a sample from Tiritea should have the owner recorded as Palmerston North City Council (PNOCC); a sample from a park or residence in Palmerston North should have the owner recorded as Palmerston North (PNORTH). For one-off inspections in rural areas record the owner as "RURAL". This avoids the owner table becoming cluttered with individual names that probably will not be used again.

### **SITE CODE**

A unique computer-generated site identification number to designate a specific site. This number maps the site details to inspection and disorder details. Lists of site codes for individual forests will be generated for individual inspectors. A forest site is defined as a compartment, block, stand, or a shelter belt. For sites not previously inspected put "new".

This field is mandatory, and recording the site code will avoid having to record owner name, site type, bioregion and area. In addition, the forest name and stand details may be abbreviated if the site code is recorded. In this instance, details such as "Kroa" and "16" may be recorded in the location and stand fields, respectively. Abbreviated location and stand details enable checks in case the site code is incorrectly entered, and enable diagnostic service staff to determine the location of the sample without having to interrogate the database each time a sample is received.

### **LOCATION**

Forest name, rural or urban address. Record only the forest name in full and do not put "Forest" after it, i.e., "Kaingaroa", not "Kaingaroa Forest". Do not use abbreviated forest names unless the site code is entered. For urban addresses record all details in this field, except where one wants to differentiate specific areas within a large park or reserve. In these cases record the name of the park or reserve in the location field and the specific area in the stand field. For instance, the location should be "Cornwall Park" and the stand could be "Archery Club".

### **STAND**

Used mainly for a forest environment, i.e., compartment, stand, or plunit number. Compartment numbers are stored in the database as thousands, i.e. "Cpt 0012" which enables stands to be sorted in numerical order. However, on the form a "12" is satisfactory. For CHH-owned forests record the cell number, and road (if necessary), only i.e. "904987 Deer Rd". Don't write "CELL 904987 Deer Rd". A mandatory field if the inspection is made in a forest.

**SITE TYPE**

A code to designate the type of site.

Site_type	Site_description
EP	Exotic Plantation
IE	Individual Exotic Trees
IN	Individual Native Trees
NF	Native Forest
NP	Native Plantation
NU	Nursery
OT	Other
RE	Regeneration
SH	Shelterbelt
UR	Urban
WL	Woodlot

Write highlighted letters only, i.e., EP for exotic plantation, SH for shelterbelt. Urban overrides other categories, i.e., an individual exotic tree in an urban situation would be described as UR and not IE.

**LAT and LONG**

Coordinates used to mark exact location of the site. This field is mandatory, but if conditions do not allow a reading to be made write "NA" or "-" to indicate that a reading was not possible.

**BIOREGION**

Biological region as described by Crosby *et al.* 1976: Recording specimen localities in New Zealand: an arbitrary system of areas and codes defined. New Zealand Journal of Zoology 3:69 + map. The codes are shown below and a map is given in Appendix II.

Bio_region_code	Bio_region_description
AK	Auckland
BP	Bay of Plenty
BR	Buller
CL	Coromandel
CO	Central Otago
DN	Dunedin
FD	Fiordland
GB	Gisborne
HB	Hawke Bay
KA	Kaikoura
MB	Marlborough
MC	Mid Canterbury
MK	Mackenzie
NC	North Canterbury
ND	Northland
NN	Nelson
OL	Otago Lakes
RI	Rangitikei
SC	South Canterbury
SD	Marlborough Sounds
SI	Stewart Island
SL	Southland
TK	Taranaki
TO	Taupo
WA	Wairarapa
WD	Westland
WI	Wanganui
WN	Wellington
WO	Waikato

**AREA**

Area in hectares of the site.

## INSPECTION DETAILS

Inspection details are stored in the inspection table which links to the site, disorder, and identification tables. An inspection record relates to one host on one specific site, therefore a record of multiple sites or hosts on one form is not acceptable.

**DATE** Date the inspection or collection was made.

**SURNAME** Surname of the inspector or collector.

**INITIALS** Initials of the inspector or collector.

**HOST SPECIES** The host species. Must be written in full, apart from the species listed below. These species are the most commonly recorded (87% of the records in the database). Only one host species is to be recorded on the form. If a collection from an understory plant is made in a stand of, for instance, *Pinus radiata*, record the name of the understory plant on the form, and not the primary species. In mixed stands, i.e. *Pinus* and *Eucalyptus*, fill out separate forms for each species – do not record the host as *Eucalyptus* sp/*Pinus* sp or mixed exotic.

Species id	Botanical name
AAMEL	<i>Acacia melanoxylon</i>
AASPP	<i>Acacia</i> species
CHLAW	<i>Chamaecyparis lawsoniana</i>
CULUS	<i>Cupressus lusitanica</i>
CUMAC	<i>Cupressus macrocarpa</i>
EUBOT	<i>Eucalyptus botryoides</i>
EUDEL	<i>Eucalyptus delegatensis</i>
EUFAS	<i>Eucalyptus fastigata</i>
EUNIT	<i>Eucalyptus nitens</i>
EUREG	<i>Eucalyptus regnans</i>
EUSAL	<i>Eucalyptus saligna</i>
EUCSP	<i>Eucalyptus</i> species
L.DEC	<i>Larix decidua</i>
P.MUR	<i>Pinus muricata</i>
P.MBL	<i>Pinus muricata</i> (blue)
P.NIG	<i>Pinus nigra</i> var <i>laricio</i>
P.PON	<i>Pinus ponderosa</i>
P.RAD	<i>Pinus radiata</i>
POSPP	<i>Populus</i> sp
PSMEN	<i>Pseudotsuga menziesii</i>
ULMSP	<i>Ulmus</i> sp

**TREATMENT** A code to describe the host treatment, use highlighted letters, i.e., UT for untended, PR for pruned, PT for pruned and thinned, etc.

Treatment_id	Treatment_description
-	Not stated
CL	Clearfelled
ES	Established
PF	Pruned/Followers
PR	Pruned
PT	Pruned and Thinned
RE	Regenerated
T	Thinned
U	Untended

<b>ESTAB. YEAR</b>	Year host was established (two digits is acceptable). This field is important as the establishment year can be used to differentiate various stands within a compartment. It is also useful for diagnostic staff to know the age of the host.
SPH	An estimate of the stocking of the stand (stems per hectare). For shelterbelts, record the actual number of trees rather than the sph.
DIAM (mm)	Average diameter in millimetres of the host.
HEIGHT (m)	Average height in metres of the host.
<b>INSPECTION TYPE</b>	Records the type of survey that was carried out, i.e. Exotic forest survey for NZFOA members, risk site survey, public enquiry, etc.

<b>Inspection_type_i</b>	<b>Inspection_type</b>
BL	<b>BL</b> itz Survey
DOC	<b>DOC</b>
FF	Exotic <b>F</b> orest Survey ( <b>FOA</b> )
FN	Exotic <b>F</b> orest Survey ( <b>N</b> on FOA)
SB	Forest <b>S</b> mall <b>B</b> locks
OC	<b>O</b> ther <b>C</b> ommercial
OI	<b>O</b> ther <b>I</b> ndigenous
PE	<b>P</b> ublic <b>E</b> nquiries
RS	<b>R</b> isk <b>S</b> ite Survey
SP	<b>S</b> Pecial Survey
PR	Specific <b>P</b> est <b>R</b> esponse



## **DISORDER DETAILS**

Disorder details are recorded when a disorder of significance is noted during an inspection. Information recorded in this table forms the basis of the reports to forest owners. In some cases it is useful to record details of a disorder even if it is not severe. For instance, if a stand had a history of high levels of *Dothistroma pini* but *Dothistroma pini* disease levels were low in the current year it would be useful to record the low severity so that a complete history of disease levels was maintained.

Position, Type, Severity, Extent, and Incidence are mandatory fields if Disorder Description and Agent Name are recorded.

### **DISORDER DESCRIPTION**

A description of the symptom or damage affecting the host. For instance: branch dieback, needlecast, yellowing, leaf spot, butt damage, resin bleed, etc.

### **AGENT NAME**

The cause of the disorder. If the agent is an insect or fungus the full Latin binomial should be recorded, not the common name. For instance, *Pineus laevis* and not woolly pine aphid. Examples of descriptions and agents are as follows: Needlecast/*Cyclaneusma minus*, Needle blight/*Dothistroma pini*, Whorl canker/*Sphaeropsis sapinea*, Leaf spot/*Kirramyces eucalypti*, Wood boring/*Hylastes ater*. On occasion the agent is abiotic or unknown or the same as the description, for instance it is ok to have a combination of Resin bleed/Resin bleed if the cause of the resin bleeding is unknown; or UMCY/UMCY, leafspot/leafspot, etc. Some combinations for non fungal or non insect agents are Branch breakage/Wind damage; Lateral damage/Possum damage; Pale crowns/Nitrogen deficiency, etc.

### **ASPECT**

The general aspect if the disorder was related to aspect. Write "-" if the disorder appears unrelated to aspect.

### **TERRAIN**

The terrain if the disorder was related to terrain. Write "-" if the disorder appears unrelated to terrain.

<b>Terrain_id</b>	<b>Terrain_description</b>
FL	Flat
GU	Gully
RI	Ridge
SL	Slope
UN	Undulating

### **POSITION**

Position of the disorder in the host.

<b>Disorder_position_i</b>	<b>Disorder_position_descriptio</b>
BA	Bark
BR	Branches
BU	Buds
CA	Cambium
DE	Debris
EN	Entire Tree
FO	Foliage
LI	Litter
RC	Root Collar
RO	Roots
SE	Seed
ST	Stem
TE	Terminal
WO	Wood

**TYPE**

General description of disorder type, i.e. *Dothistroma pini* would be FU for fungal, Spray damage - CH for chemical damage, Nitrogen deficiency - NU for nutritional. This field enables extraction of disorders by broad categories – i.e. fungal damage, insect damage, chemical damage, etc. Mortality is recorded when the cause of the mortality is not known. For mortality caused by, for instance, Armillaria root rot, record the type as "FU" and not "MO".

Disorder_type_id	Disorder_type_description
AN	Animal Damage
CH	Chemical Damage
FI	Fire Damage
FU	Fungal Damage
IN	Insect Damage
ME	Mechanical Damage
MO	Mortality
NU	Nutrient Deficiency
OT	Other Abiotic
RD	Root Damage
WA	Water Damage
WE	Weather Damage

**SEVERITY**

Code for the severity of the disorder which can be in two different formats: (1) Code for severe, high, medium, low, trace, or no damage (S, H, M, L, T, N); or (2) a percentage (i.e, 25%). A disorder such as needle blight caused by *Dothistroma pini* should be assessed as a percentage, but some disorders are more easily expressed as a general description, i.e., resin bleeding would be assessed as S, H, M, L, or T. Where it is useful to record the presence of a disorder or organism even if it is not causing damage (for instance *Hylurgus ligniperda* under the bark of a stump), the severity should be recorded as "N".

disorder_severity_i	disorder_severity_description
S	Severe
H	High
M	Medium
L	Low
T	Trace
N	No damage
%	Severity % score

**EXTENT**

General description of the incidence and spread of the disorder at the site.

Disorder_extent_id	Disorder_extent_description
CL	Clustered
IS	Isolated
LO	Localised
SC	Scattered
WI	Widespread

**INCIDENCE**

Assessment of the incidence of the disorder (the percentage of affected hosts within the area assessed). Should always be expressed as a percentage. Where only one affected host specimen is found record the incidence as 1%. Not mandatory if severity is assessed as low, trace or no damage.

**COMMENTS**

General notes about the inspection or collection. If the stand is healthy, write healthy in the comments and not in the disorder section of the form.

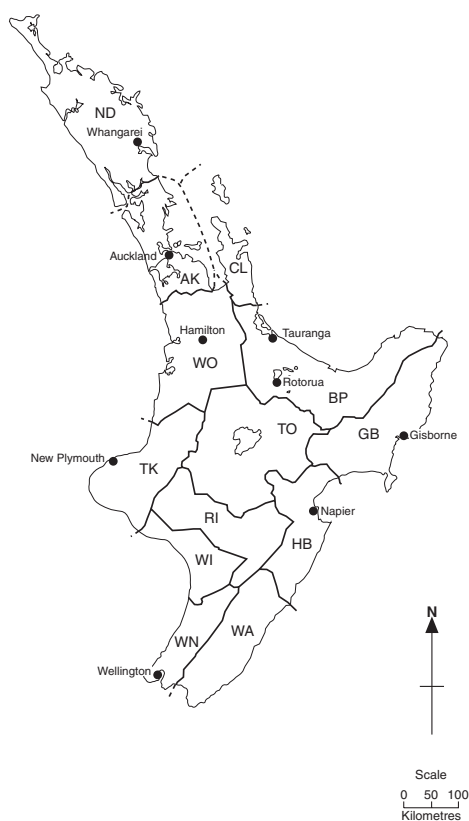
**NB – If you are sending a sample that should be opened under quarantine conditions write "Q" on the top left-hand corner of the form above the serial number.**

## IDENTIFICATION DETAILS

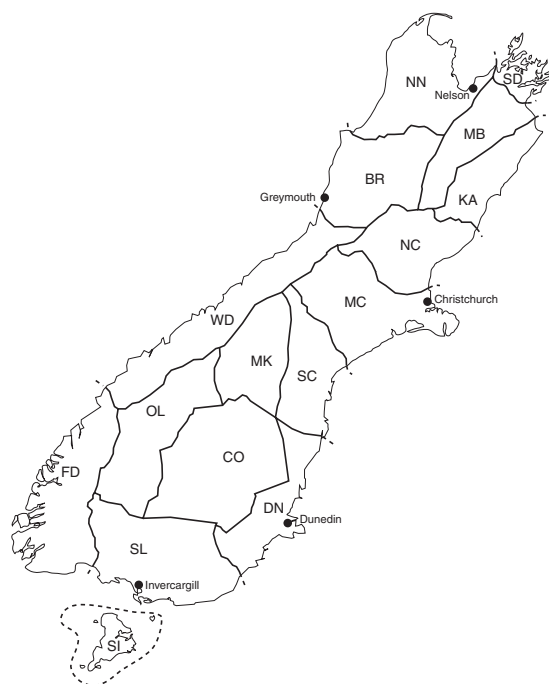
These details are entered by the Forest Health Reference Laboratory at Forest Research. They are included in this document to describe what they are and how they are used in the Reference Laboratory.

DATE	The date identification was completed.
EXAMINED BY	The person or people responsible for examining the sample.
CULTURE NO.	To reference cultures to collection form details. It is used for fungal identifications only.
HERBARIUM NO.	Reference number to fungal herbarium, if the fungus is retained.
CONFIDENCE	A rating from A to D to indicate the certainty of the identification. A: Certain of identification. B: Not absolutely certain of identification. C: Unidentified. D: Nothing found.
EFFECT	A rating from A to D to indicate the probability of the cause of the disorder. A: Certain that the agent caused the disorder. B: Reasonably sure that the agent was involved to some extent with the disorder. C: Uncertain that the agent was involved or caused the disorder. D: Certain that the agent was secondary, and did not cause the disorder.
TYPE	Invertebrates (I), Fungi, bacteria, algae (F), Can't identify (X), Abiotic or others (O).
IDENTIFICATION	The full latin binomial of the identification. If the organism can't be identified to species the next highest level is entered. For instance, <i>Acizzia dodonaeae</i> , then <i>Acizzia</i> sp., then Psyllidae.
FAMILY	For invertebrate identifications.
RETAINED	Whether the specimen was retained for future reference.
COMMENTS	General notes on the identification or diagnosis.

Appendix II - New Zealand  
Biological Regions (after Crosby *et al.* 1976)



Appendix II - New Zealand  
Biological Regions (after Crosby *et al.* 1976)



**FOREST OWNERS ASSOCIATION**

**PERMANENT VIEWPOINT METHOD**

**FIELD MANUAL**

**VERSION 2.0**

(DRAFT)

**Produced by**

**Simon Anderson**

**March 2005**

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## **Disclaimer**

The CHH Viewpoint Condition Survey has been designed specifically to utilise the skill and expertise of New Zealand Forest Health Assessors (FHAs). The authors insist that Forest Health Condition Assessment, as described in this manual, be carried out only by qualified Forest Health Assessors, as opposed to forestry coordinators, technical crews, or otherwise.

A definition of a qualified FHA, in the authors' view, is described below:

FHAs are qualified by conforming to *both* of the following criteria:

1. Have obtained a current (New Zealand) National Certificate in Forest Health Surveillance.
2. Are being continually trained, coached and updated (in New Zealand) by experienced Forest Health Assessors / Forest Entomologists / Forest Pathologists, as part of their professional development.

The authors insist that no Forest Health Condition assessments, as described in this manual, be undertaken by untrained assessors. No responsibility is taken by the authors, for the incorrect use and application the following Condition Survey methodology.



## **Introduction**

This manual covers the field operations in the establishment, assessment, and reporting on forest condition monitoring carried out under the Viewpoint method. The Condition Survey is a management tool as opposed to a detailed scientific survey. It is intended to flag problem areas and instigate further action, for example more detailed surveys and / or operational response. Further discussion of this approach to forest condition monitoring can be found in Hosking and Anderson 2003<sup>1</sup>.

In summary the viewpoint condition monitoring methodology aims to deliver:

- a broad measure of forest condition change over time,
- early warning of increased impact of specific pests and diseases,
- knowledge of estate health status at a forest, regional, and national level,
- improved communication between forest health service providers and forest managers, and
- greater awareness of forest health issues at both a forest and company level.

This manual will cover the following key areas relevant to the field implementation of the strategy:

1. Forest level site allocation
2. Monitoring site establishment
3. Monitoring site assessment
4. Forest level reporting
5. Incursion response.

Equipment requirements are discussed under the relevant sections but assessors will require a GPS unit, a compass, and good quality binoculars to undertake this work.

---

<sup>1</sup> Hosking G. P. and Anderson S. (In Press). Towards a National Condition Monitoring Strategy. New Zealand Journal of Forestry.

## **Viewpoint Site Allocation**

A number of rules have been developed as the basis for deciding the number and location of sites to be established in a specific forest area. These rules are to act as a guide, but input to the number and location of sites is encouraged from the forest managers or owner.

### **Number of sites**

At an estate level it is proposed to have not less than one viewpoint site per 1,000 ha of forest. Where two or more forests adjoin, the forest manager should be consulted to determine the defining forest or where management unit boundaries occur

No forest will contain less than one site.

All forests greater than 1,000 ha will be included in the Permanent View Point (PVP) monitoring programme.

Forests less than 1,000 ha may be included, but this should be at the specific request of the owner or lessor, outside of the FOA Survey. In such cases, the data should be incorporated with the FOA database for ease of reporting.

### **Age class distribution**

Establishment should aim to place ~80% of plots in an individual forest in stands aged between 3 and 18 years.

The remaining ~20% of plots should be located in stands aged 19 years and over. Companies that do not intensively sample age 1 and 2 stands during the establishment phase may wish include such stands in the survey.

The above rationale is based on the greater ability to influence tree health through normal forest management practice in the 3 to 18 year age classes.

### **Tree species**

PVPs can be used for any tree species.

# **Viewpoint Site Establishment**

Site establishment is the most critical element in implementing the viewpoint based strategy. The quality of the viewpoint site will determine the quality of the assessment data. However, the quality of sites will vary depending on the geography of specific forest areas, the age of stands etc.

## **Site Access**

The location of assessment sites will be influenced by site access and proximity to the FOA detection survey route.

Because of the basic principle of time and cost effectiveness of the viewpoint strategy, only in exceptional circumstances will sites be located away from vehicle access. Any such sites should be specifically justified and agreed by the forest manager.

As always, safety is paramount. Sites must not be located in unsafe areas. For example:

- not down washed out roads
- not on precarious ledges
- not up trees
- not in busy operational areas (such as off the edge of a superskid).

## **Site selection**

Assessment sites should be selected to offer the least obstructed view of between 10 and 40 ha of single age class forest. Suggested prioritised locations are:

- Ridge located skid site
- Ridge located road junction
- Road edge across valley view
- Up-slope view from valley bottom
- Flat site road junction.

Each site will view only one age class of trees.

It is recognised there will be variation in site quality, however it is expected 75% of sites will provide good overview for canopy assessment purposes.

## **Site identification**

The primary site identification character will be its geographic position derived from a GPS reading. The positional error of such a reading from a late model GPS, such as a Garmin 12XL, is expected to be less than 5m and will mostly be less than 2m.

The following GPS setup is required:

- datum to be WGS 84
- position format Latitude / Longitude
- Lat. / Long. Recorded as degrees/minutes/decimal minutes

The site position would appear as:    S 38 24.350  
    E 176 30.420 (for example)

The rationale for this format is the future standard NZ Geodetic Datum 2000 which is for practical purposes the same as WGS 84.

The site will also be located on a 1:25,000 forest map (for implementation purposes), and also in more detail on a 1:10,000 map (for future reference), both illustrating the view centre.

## View centre

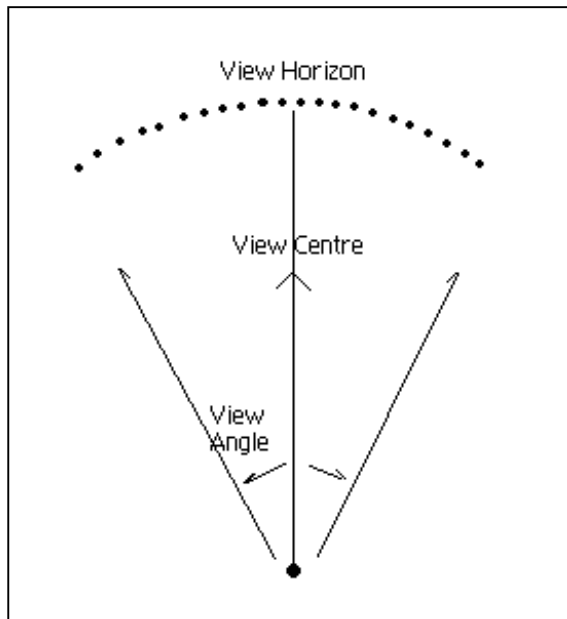
The area to be assessed is defined as the view (Figure 1). For any site there will be a single view encompassing a single age class as defined by establishment date. The view centre is a magnetic compass bearing from the viewpoint through the centre of the stand being assessed.

The view centre will be defined by:

- a magnetic compass bearing
- a direction arrow on the forest map (1:25,000 and / or 1:10,000 scale)
- a direction arrow on the assessment sheet line sketch.

The GPS position, forest maps and compass bearing should, for practical purposes, ensure the same area of forest is assessed at each individual assessment.

Figure 1. View Area



## Site deletion or repositioning

Sites will be deleted over time and new sites added to accommodate the desired age class distribution.

Sites might also be moved to better positions at any time due to access or loss of view from surrounding tree growth. Full establishment data must be collected for the new site and the database must be up-dated.

All site repositioning should be done in consultation with the Forest Manager. This should not be an onerous process. If they are unable to attend in person in the field, it is likely that the Forest Manager will accept the assessor's new location without question.

# **Viewpoint Site Assessment**

The assessment of Viewpoint monitoring sites involves three phases:

- Pre-field visit preparation
- Field assessment
- Submission of data

## **Pre-field visit preparation**

Prior to undertaking site assessments service providers need to:

- be in contact with the Forest Manager / Forest Supervisor, particularly to ensure all OSH / Company Work Rules (including radio requirements) will be adhered to
- obtain the appropriate forest maps which have been used at site establishment
- obtain copies of assessment forms for all sites to be visited showing all site and location data
- ensure GPS unit is set on datum WGS 84 and formatted as degrees/minutes/decimal minutes
- ensure compass and binoculars are available.

## **Field assessment**

### **Equipment required**

The following equipment is necessary for undertaking field assessments:

- Compass
- GPS unit and spare batteries
- Binoculars
- Camera
- Assessment site sheets (plot sheets)
- Sample collection equipment
- Forest maps
- Stand maps.

### **Site identification**

The first objective of the field assessment of any site is to confirm its position. For most sites this should be obvious, but if there is any doubt a live GPS position should be checked against the site data.

## View

Once the assessment position has been confirmed the view centre should be established by identifying the compass bearing given in the site data. The view area will normally be around 45° either side of this centre line and a comfortable distance forward, approximately 500m. The 1:10,000 site map should give an indication of where the view centre terminates. In many cases the line will start some way out, and will always pick out one age class only.

## Assessment principles

The assessment is carried out by scanning the tree crowns and overall canopy using binoculars looking for specific pest and disease symptoms as well as damage from unknown causes. The key principles of this assessment are:

- keep it simple – do not try to record every minor influence. The objective is to identify significant forest health impacts.
- ask the question, is this observation relevant to forest management and the needs of the forest manager?
- write only relevant comments, this is not a test of how many agents can be detected.
- score health impacts using a single % figure based on the number of trees affected in the stand and a single number on the 5 point severity scale.

## Data to be recorded on the Plot Sheet (refer to Appendix 3)

At site establishment the following data will be recorded on a paper version of a Microsoft Access Form, codes for each field are listed in brackets:

- Forest being assessed (name)
- Road from which site is accessed (name - if on located a stub rd, list main road name / stub road , eg Galaxy rd / Stub C)
- Site number ( beginning at 1 for each forest )
- Region (name, as defined by the forest manager)
- Compartment (number, if required)
- Date of site establishment (dd/mm/year)
- Person undertaking site establishment (Surname then first initial, eg Anderson S)
- GPS position in Lat./Long (in WGS 84 datum).
- Compass bearing of view centre (degrees - magnetic)
- Land form (Face / Gully / Ridge / Flat / or Road-edge)
- Slope (Flat / Rolling / Steep)
- Aspect (N / S / W / E / NW / NE / SW / SE)
- Drainage (Good / Fair / Poor)
- Exposure (Sheltered / Medium / Exposed)
- Species ( P.radiata / E. nitens / E. fastigata / D fir / S.sempervirens)
- Establishment year (year)
- Silviculture (Juvenile Age 1-5, Thinned, Pruned, Thinned and Pruned, Untended)
- Sample Coll Ref (if a sample is taken record Forest Health Collection form number)
- Photo (yes / no)

- Photo ref (number the photo in some way – either in notebook, on back of photo. Alternatively record a reference number in the filename of the jpeg, if a digital photo is taken)
- Health impacts (score incidence/severity as per key written next to ‘Health Impacts’)
- List Major Deficiency (name of major deficient element)
- Key Impact (if you have scored the site as a 3,4, or 5 you MUST list the major forest health impact in this box – if you score it a 1 or 2 then you should NOT list a ‘Key Impact’)
- Stand Health Rating (list your overall impression of stand health, from 1-5, based on the key below this box)
- Comments (list any comments or explanations you deem relevant to this site)
- Line sketch map of site location (not recorded on the Plot sheet – see ‘Mapping Requirements’ below)

### Mapping requirements

During site establishment, view centres will be recorded on 1:25000 maps for practical reasons. These lines need to be very accurately recorded, as they will be translated on to 1:10000 maps and used for subsequent surveys. Now refer to Appendix 4 - the view centre should be a narrow straight line, starting at the point GPSed, and terminating where vision is interrupted by contour, or a new age class. An arrow head should indicate the direction of the plot. If the immediate foreground is not surveyed (eg viewing over grass, scrub, or an unwanted age class), then this should be represented on the map by a dotted line – then becoming a solid line where the view begins.

### Additional information

A physical inspection of the stand should only be made if there is good cause, and might involve individual tree inspection and/or collection of a sample. If the latter, note the collection number on the assessment form and follow normal protocols of documentation in forwarding samples for diagnosis. If a photo has been taken (digital photos preferred) at any point it should be identified on the assessment sheet. Comments should be strictly limited to what is relevant from a forest manager’s perspective. Photos should really only be taken to highlight a very significant impact.

### Stand health rating

A single figure stand health rating should be given based on a forest health professional’s knowledge of what a perfectly healthy stand in that particular forest area should look like i.e. a 1. ‘Key Impacts’ must be recorded in a severity score of 3 or greater in the Health Impacts table.

### Completing Forest Level Summary information

A blank Forest Level Summary sheet should also be provided by the FOA administrator. The assessor must consider all plots measured in each forest, and complete the fields under the following headings on the Summary sheet:



- **Average Condition Score:** Add all the plot scores and divide by the number of plots
- **Action Required:** In any part of the forest, do you think the forest manager should take some form of action, be it more intensive monitoring, pest control, foliar sampling for deficiencies etc. If so, then record 'Yes.' If not, record a 'No.'
- **Brief Description of Action Required:** Note the action required in 50 words or less (eg 'Monitor the age class represented by plot 4 for possum damage, in the greater Pinedale area'). Note only 255 characters are allocated within the database field for this description – hence the '50 words or less' requirement.
- **Signed:** Signature of Assessor
- **Date:** Date Summary Report was completed (should be same day of last plot surveyed)

## Submission of data

A centralised system of data management will be used with the service provider's responsibility ending with fully completed assessment sheets, grouped by forest, being forwarded to a designated forest manager or co-ordinator. Completed sheets should not be forwarded until forest level summary reporting has been completed.

## **Condition Statement data - Forest Level**

As discussed, the Condition Statement at the “Forest Level” involves the summary of assessments from all sites within a single forest. The “Condition Statement - Forest Level” is designed to focus on significant impacts and eliminate all extraneous information. It is specifically designed to inform the forest manager of the overall health of the forest and draw attention to any specific problems. The Report has three hierarchical components:

1) Forest Level summary report (refer to Appendix 1):

- Average Condition Score (average of individual plots within the forest)
- Action required (‘Yes’ or ‘No’)
- Brief description of any action required
- Assessor sign off and date.

2) Summary of plot information (refer to Appendix 2):

- List of individual plot scores and ‘Key Impacts.’

3) Detailed plot information (refer to Appendix 3):

- Contains individual plot sheets and 1:10000 location maps.

The three components are stapled together and form the Forest Level report. The database is capable of producing further summaries by management unit as required.

## **Hardware and Software – a Standard Database Platform**

Personal Computers (hardware) and Microsoft Access (software) were chosen as the standard platform to support the management of Condition Survey data, for the following reasons:

- Ease of access to PCs and MS Access for all involved
- Low cost
- Sufficient data storage and reporting capability
- To encourage common reporting among industry.

The intention of the FOA is to migrate to mapping of view centre lines to shape-files embedded in GIS layers.

## **Feedback from forest manager**

The Forest Manager / Forest Leader may wish to contact you for further discussion, or may wish to revisit the problem area that has been highlighted.

## **incursion response**

It is possible that the assessor may encounter a health condition which requires an urgent response. Such action might result from a significant impact which cannot be explained or serious outbreak of a known exotic pest or disease. Assessors should be familiar with protocol surrounding potential incursions. Refer to the Biosecurity Act 1993, Ministry of Agriculture and Forestry (MAF), and / or Forest Research for further information. A broad outline of protocol is described below.

Immediate action will involve:

- description of impact
- documentation of site
- collection of samples
- notification of forest manager and authorities.

### **Description of impact**

The damage should be described in detail, including extent within the stand, apparent impact on the tree, and its visual characterization.

### **Documentation of site**

A sketch map of the stand showing the location and extent of damage relative to the assessment point, should be made. If necessary a GPS location may be established within the stand and related to the affected area.

### **Collection of samples**

Normal sample collection protocols should be followed and samples forwarded for diagnosis without delay packaged to ensure good condition on arrival. Quarantine packaging and other measures may be required.

### **Notification to forest manager and authorities**

The forest manager should be notified directly of the event and all necessary information forwarded without delay. This notification should be both verbal and written, to avoid messages being lost or missed.

Under Section 44 (General Duty to Inform) of the Biosecurity Act 1993:

*“Every person is under a duty to inform the Ministry, as soon as practicable in the circumstances, of the presence of what appears to be an organism not normally seen or otherwise detected in New Zealand.”*

In practice this means it is likely that trained assessors will also be reporting any unusual findings to MAF.

## **training and development**

While the application of this methodology has been field tested across a number of sites in New Zealand, we recognise further training and development may be required to suit various estates or forest owners. Please contact the authors at the addresses below, if you have any queries regarding the Viewpoint method:

**Simon Anderson**

Estate Risk Manager  
CHH Forests  
PO Box 3106, Napier

Ph. 06 834 0380 / 027 220 9559  
Email: [simon.anderson@chh.co.nz](mailto:simon.anderson@chh.co.nz)

**Gordon Hosking**

Forest Health Consultant  
Hosking Forestry  
RD 2 Tikitere

Ph. 03 345 6861 / 025 586 500  
Email: [gordon.hosking@xtra.co.nz](mailto:gordon.hosking@xtra.co.nz)

## CHH Forest Health Condition Report

Forest: Riverhead

Average Stand Health Rating: 1.89

Action Required? **Yes**

*Brief Description of Action Required:*

The ageclass represented by plots 1, 2 and 8 is beginning to show the effects of increased possum populations. Suggest a further survey of this ageclass to gauge how widespread the damage is. Possum control should be considered in the Browns Rd vicinity.

Signed (FH Assessor):  
17/11/03

Simon Anderson Date:

## **Appendix 2 – example of Condition survey forest Plot Summary Report**

### **031117 - Riverhead Condition Survey - Plot Summary**

<b><i>Forest</i></b>	<b><i>Date</i></b>	<b><i>Site No</i></b>	<b><i>Stand Health Rating</i></b>	<b><i>Key Impact</i></b>
Riverhead	17/11/20	1	3.0	Possums
Riverhead	17/11/20	2	3.0	Possums
Riverhead	17/11/20	3	1.0	
Riverhead	17/11/20	4	2.0	
Riverhead	17/11/20	5	2.0	
Riverhead	17/11/20	6	1.0	
Riverhead	17/11/20	7	2.0	
Riverhead	17/11/20	8	2.0	
Riverhead	17/11/20	9	1.0	

***Thursday, 25 March 2004***

***Page 1 of 1***

## Appendix 3 – example of Condition Survey Plot Sheet

<b>Forest</b>		<b>Compass</b>		<b>Species</b>	
<b>Road</b>		<b>Land Form</b>		<b>Establishment Year</b>	
<b>Site No</b>		<b>Slope</b>		<b>Silviculture</b>	
<b>Date</b>		<b>Aspect</b>		<b>Sample Coll Ref</b>	
<b>Assessor</b>		<b>Drainage</b>		<b>Photo</b>	
<b>Easting NZMG</b>		<b>Exposure</b>		<b>Photo Ref</b>	
<b>Northing NZMG</b>					

**Health Impacts**

1=present, 2=minor damage, 3=impact on growth, 4=serious impact on growth (death uncommon), 5= tree death

Dothistroma Incidence	
Dothistroma Severity	
Cyclaneusma Incidence	
Cyclaneusma Severity	
Strasseria Incidence	
Strasseria Severity	
Armillaria Incidence	
Armillaria Severity	
Diplodia Incidence	
Diplodia Severity	
Possum Incidence	
Possum Severity	
Goat Incidence	
Goat Severity	0

Use "other" to describe additional or unknown impacts. list the suggested agent

Other 1 Incidence	
Other 1 Severity	
Other 2 Incidence	
Other 2 Severity	

List Major Nutrient Deficiency

--	--

**Key Impact**

**Stand Health Rating**

1=Healthy, 2=Near Healthy, 3=Intermediate, 4=Significant Damage, 5=Severely Debilitated

Deer Incidence	
Deer Severity	
Hylaestes Incidence	
Hylaestes Severity	
Lightning Incidence	
Lightning Severity	
Nutr Defic Incidence	
Nutr Defic Severity	
UMCY Inciden	
UMCY Severit	
Wind Incidence	
Wind Severity	
Salt Incidence	
Salt Severity	

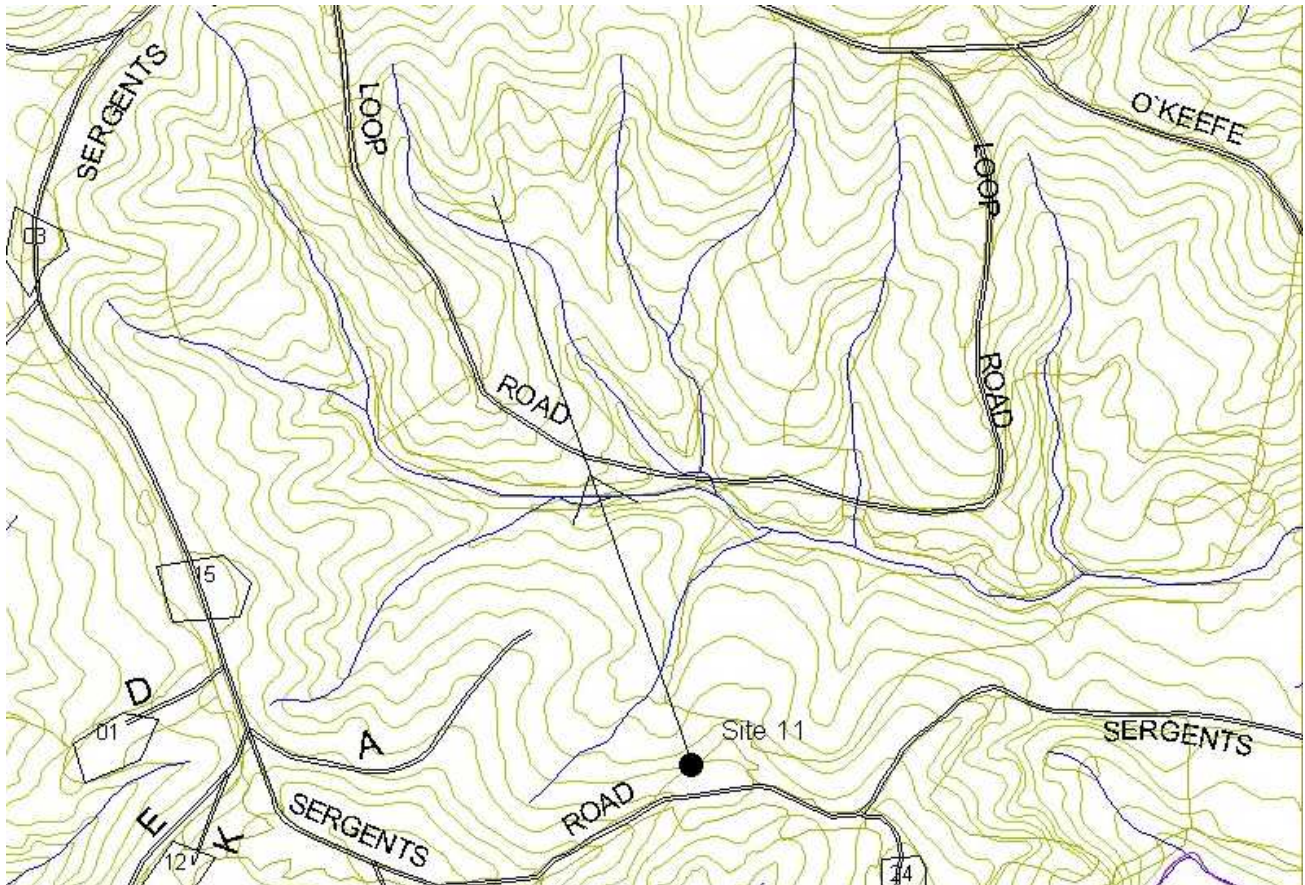
**Comments**



## **Appendix 4 – example of a ‘View Centre’ Map**

NB: Also referred to as ‘Plot Map.’

NB: This is a fictitious plot, serving as an example.





## Appendix 3: National Certificate in Forest Health Surveillance

level of qualification: 5

credit total: 110

	Compulsory	Elective
level 2 credits:	14	-
level 3 credits:	16	0-11
level 4 credits:	21	0-10
level 5 credits:	21	0-19
level 6 credits	22	-
minimum totals:	94	16

registration date: 20 November 2001

final date for comment: 30 November 2005

expiry date: 31 December 2006

**replacement information:** This qualification and the National Certificate in Forest Produce Inspection [Ref: 0908] replace the National Certificate in Forest Health Protection with strands in Forest Health Surveillance, and Forest Product Quarantine [Ref: 0482].

### fields, sub-fields and domains:

#### AGRICULTURE, FORESTRY AND FISHERIES

##### Agriculture

agricultural vehicles and machinery

##### Forestry

chainsaw operating

forest health surveillance

forest produce inspection

forest silviculture

forestry knowledge

technical forestry

## LAW AND SECURITY

Biosecurity  
border quarantine

## SERVICE SECTOR

Driving  
specialist driving knowledge and skills

### **standard-setting body responsible for the qualification:**

Forest Industries Training

### **other standard-setting bodies whose unit standards are included in the qualification:**

Agriculture Industry Training Organisation  
NZ Road Transport and Logistics Industry Training Organisation

## **1 purpose**

This certificate is awarded to people who have demonstrated competence in the surveillance of forests and trees to detect and monitor health disorders. The certificate recognises knowledge of the international conventions and agreements relating to introduced and established organisms in New Zealand, and the detection and management of health disorders of trees and forests.

## **2 regulations for the qualification**

### **2.1 entry information for programmes of education and training assessed against the unit standards in the qualification**

Open. However due to the nature of the content of the relevant specialist unit standards, Forest Industries Training recommends the prospective candidates hold an appropriate forestry qualification such as a forestry degree, a New Zealand Certificate in Forestry, or a National Diploma in Forestry, and be employed in the forest industry.

## 2.2 summary of qualification requirements

This qualification will be awarded to people credited with the compulsory unit standards, and who have met the requirements of the elective section.

## 2.3 detailed qualification requirements

### Compulsory

*All the unit standards listed below are required.*

FIELD: AGRICULTURE, FORESTRY AND FISHERIES

Sub-field: Forestry

domain: chainsaw operating

Unit No.	Unit Standard Title	Level	Credit
6916	Demonstrate knowledge of the Code of Practice relating to chainsaw use	2	5
6917	Operate a chainsaw	3	5

domain: forest health surveillance

Unit No.	Unit Standard Title	Level	Credit
5695	Identify the characteristics and control of forest insects	6	8
5696	Identify the characteristics and management of forest pathogens	6	8
5697	Identify abiotic disorders affecting forest and tree health	6	6
5870	Demonstrate knowledge of forest health protection principles	4	5
5871	Assess forest health from the air	4	4
5872	Assess forest health in plantation forests on the ground	5	4
5873	Assess forest health in forest nurseries	4	4

domain: forest silviculture

Unit No.	Unit Standard Title	Level	Credit
1135	Demonstrate knowledge of nutrient management in commercial forestry	5	4

domain: forestry knowledge

Unit No.	Unit Standard Title	Level	Credit
1241	Demonstrate knowledge of plantation forest establishment and silviculture	2	4
17769	Demonstrate knowledge of the general requirements for employment in a plantation forest	2	5

domain: technical forestry

Unit No.	Unit Standard Title	Level	Credit
1123	Use maps and photogrammetry to survey land for commercial forestry	4	4
1124	Use maths, and statistics functions and procedures in commercial forestry	5	6
1126	Demonstrate knowledge of botany for commercial forestry	3	8
1131	Demonstrate knowledge of seeds, nurseries, and tree improvement in commercial forestry	5	4
14666	Demonstrate knowledge of earth science for commercial forestry	4	4
14667	Demonstrate knowledge of forest ecology	5	3

FIELD: LAW AND SECURITY

Sub-field: Biosecurity

domain: border quarantine

Unit No.	Unit Standard Title	Level	Credit
16819	Demonstrate knowledge of global biosecurity awareness and the New Zealand response	3	3

**Elective**

*A minimum of 16 credits is required from the following unit standards.*

**FIELD: AGRICULTURE, FORESTRY AND FISHERIES**

Sub-field: Agriculture

domain: agricultural vehicles and machinery

<b>Unit No.</b>	<b>Unit Standard Title</b>	<b>Level</b>	<b>Credit</b>
10099	Ride a Special Purpose Vehicle (SPV)/ All Terrain Vehicle (ATV) on undulating terrain	3	2

Sub-field: Forestry

domain: forest health surveillance

<b>Unit No.</b>	<b>Unit Standard Title</b>	<b>Level</b>	<b>Credit</b>
5874	Assess forest health in native forests	5	6
5875	Assess tree health in the urban forest environment	5	8
18615	Demonstrate the use of the Global Positioning System in forest operations	5	5

domain: forest produce inspection

<b>Unit No.</b>	<b>Unit Standard Title</b>	<b>Level</b>	<b>Credit</b>
5700	Identify insects and fungi in forest produce for export	4	4
5705	Demonstrate knowledge of quarantine methods and controls for forest produce	4	6

FIELD: SERVICE SECTOR

Sub-field: Driving

domain: specialist driving knowledge and skills

Unit No.	Unit Standard Title	Level	Credit
17976	Demonstrate knowledge of operating a four wheel drive (4WD) vehicle	3	3
17977	Demonstrate knowledge of planning requirements for extended off-road four wheel drive (4WD) driving	3	2
17978	Operate a light four wheel drive (4WD) vehicle in an off-road environment	3	4

### **3 accreditation option**

Evaluation of documentation and visit by representatives of NZQA and Forest Industries Training.

Further accreditation requirements depend on the electives undertaken, and can be found on the unit standards concerned.

### **4 certification**

The certificate will display the logos of NZQA and Forest Industries Training.

### **5 transition arrangements**

#### **5.1 non National Qualifications Framework transition**

None.

#### **5.2 National Qualifications Framework transition**

This qualification and the National Certificate in Forest Produce Inspection [Ref: 0908] replace the National Certificate in Forest Health Protection with strands in Forest Health Surveillance, and Forest Product Quarantine [Ref: 0482].

*Summary of changes between this qualification and the Forest Health Surveillance strand of Ref: 0482.*

- Unit standards removed - 1307, 3491, 5698, 6401 and 6402 from the core compulsory, 1212 from the strand compulsory, and 5699 from the strand elective.
- Unit standard 17769 has replaced unit standards 1211, 1213, 1214 and 1215.
- Unit standard 16819 added to the compulsory section and unit standards 10099, 17976, 17977, 17978, 18615 added to the elective section.
- The level has increased from 4 to 5.

People part way through the National Certificate in Forest Health Protection with strands in Forest Health Surveillance, and Forest Product Quarantine [Ref: 0482] may choose to complete that qualification or transfer their existing credit to either of the replacement qualifications. The final date for award is 31 December 2002.

This qualification contains unit standards that are replacements of earlier unit standards. For the purpose of this qualification people who have gained credit for any of the expiring unit standards will be exempt from the requirement to gain credit for the replacement unit standards.

<b>Expiring unit standards</b>	<b>Replacement unit standards</b>
13	6916 and 6917
1128	14666 and 14667
1211, 1213, 1214 and 1215	17769

Any version of a unit standard contained within this qualification which retains its original unit standard identification number will continue to meet the requirements of this qualification.

It is the intention of *Forest Industries Training* that no existing candidate is disadvantaged by the introduction of this qualification. Any person who considers they have been disadvantaged is invited to contact:

The Chief Executive Officer  
FITEC  
PO Box 137 067  
Parnell  
AUCKLAND  
Telephone: 09 356 7250  
Fax: 09 356 7350  
Email: [john.blakey@fitec.org.nz](mailto:john.blakey@fitec.org.nz)

**Comments to:**

FITEC  
Qualification Revision  
PO Box 160  
WELLINGTON

*by 30 November 2005.*

**Please Note:** Providers must be accredited by the Qualifications Authority before they can offer programmes of education and training assessed against unit standards.

Accredited providers assessing against unit standards must engage with the moderation system that applies to those unit standards.



**Prerequisite Diagram**

