Level 2 Certificate of Technical Competence in Problematic Plants, Pests, Weeds and Diseases (0145-21)

August 2017 Version 1.2

Qualification Handbook

Qualification at a glance

Industry area	Horticulture
City & Guilds number	0145-21
Age group	16-18, 19+
Entry requirements	Centres must ensure that any pre-requisites stated in the *What is this qualification about?* section are met.
Assessment	To gain this qualification, candidates must successfully achieve the following assessments: • One to one practical assessment with oral questioning
Grading	Pass only
Approvals	Full centre approval Qualification approval
Support materials	If applicable
Registration and certification	Registration and certification of this qualification is through the Walled Garden, and is subject to end dates.

Title and level	Size (GLH)	TQT	City & Guilds qualification number	Ofqual accreditation number
Level 2 Certificate of Technical Competence in Problematic Plants, Pests, Weeds and Diseases	10	12	0145-21	603/0790/0

Version and date	Change detail	Section
1.0	First version	
1.1 March 2017	Requirement for certification modules removed	1. Introduction
1.2 August 2017	Added GLH and TQT Removed QCF	Qualification Structure Approval

Contents

1 Introduction

Purpose of this qualification?

The following purpose is for the **City & Guilds Level 2 Certificate of Technical Competence in Problematic Plants, Pests, Weeds and Diseases (603/0790/0).**

Area	Description
OVERVIEW	
Who is this qualification for?	If you are looking for a career within the horticulture industry, then this is qualification is aimed at you. The purpose of this qualification is to enable you to recognise a range of invasive/problematic plants, pests, diseases and weeds that can occur. Some present significant issues when they arise, causing potential damage to the environment, infrastructure, services or even humans. You will learn about the damage caused, and precautions and control methods. The qualification can be taken in the context of: • Agriculture • Amenity Horticulture • Countryside and Environment • Floristry • Forestry and Arboriculture • Production Horticulture You could also progress to further learning and training in this area.
What does this qualification cover?	This qualification covers the skills you will need to progress to work in the Horticultural industry. Mandatory content covers: • Legislation • Identify problematic plants, pests, weeds and diseases • Methods of prevention and control The assessment for this qualification will require you to achieve: • Practical tasks and oral questioning

WHAT COULD THIS QUALIFICATION LEAD TO?	
Will the qualification lead to employment, and if so, in which job role and at what level?	Achievement of this qualification demonstrates that you have the practical skills and knowledge to progress into work, such as an: • Assistant gardener • Assistant landscape operative • Trainee horticulture operative
Why choose this qualification over similar qualifications?	There are no other recognised qualifications for problematic plants, pests, weeds and diseases at this Level.
Will the qualification lead to further learning?	Yes. Once you have successfully completed this qualification, you could go on to study other Level 2 or 3 College-based Horticulture qualifications over one year, or two years. Over one year: • Level 2 Technical Certificate in Horticulture • Level 3 Advanced Technical Certificate in Horticulture • Level 3 Advanced Technical Diploma in Horticulture (540) Over two years: • Level 3 Advanced Technical Extended Diploma in Horticulture (720) • Level 3 Advanced Technical Extended Diploma in Horticulture (1080) (Professional Horticulture) You could also progress to an Apprenticeship in a Horticultural occupation.

WHO SUPPORTS THIS QUALIFICAITON?	
Employer/Professional Trade Association	The British Florists Association.
FURTHER INFORMATION	Please refer to the Qualification Handbook, available on the City & Guilds website, for more information on the structure of this qualification, the content of the units, and assessment.

Qualification structure

For the **Level 2 Certificate of Technical Competence in Problematic Plants, Pests, Weeds and Diseases** learners must be trained and assessed in a minimum of one of the units listed below. The qualification will be endorsed to the context of the unit assessed:

Unit number	Unit title	GLH
Learners must achieve one unit from 204 -209		
204	Problematic plants, pests and diseases in agriculture	10
205	Problematic plants, pests and diseases in amenity horticulture	10
206	Problematic plants, pests and diseases in the environment and countryside	10
207	Problematic plants, pests and diseases in floristry	10
208	Problematic plants, pests and diseases in forestry, woodland management and arboriculture	10
209	Problematic plants, pests and diseases in production horticulture	10

Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	Size (GLH)	TQT
Level 2 Certificate of Technical Competence in Problematic Plants, Pests, Weeds and Diseases	10	12

2 Centre requirements

Approval

New centres will need to gain centre approval. Existing centres who wish to offer this qualification must go through City & Guilds' **full** Qualification Approval Process. Please refer to the City & Guilds website for further information on the approval process: **www.cityandguilds.com**.

Centres that are approved to offer the relevant subject-related qualifications, new Technical qualifications or Work-based qualifications will receive **auto-approval** for these qualifications.

Please see the document on the webpage for 0145, under 'additional documents'.

Centre staffing

Staff delivering these qualifications must be able to demonstrate that they meet the following requirements:

- be technically competent in the areas in which they are delivering
- be able to deliver across the breadth and depth of the content of the qualification being taught
- have recent relevant teaching and assessment experience in the specific area they will be teaching, or be working towards this
- demonstrate continuing CPD.

Physical resources

Centres must be able to demonstrate that they have access to the equipment and technical resources required to deliver this qualification and its assessments.

Internal Quality Assurance

Internal quality assurance is key to ensuring accuracy and consistency of tutors and markers. Internal Quality Assurers (IQAs) monitor the work of all tutors involved with a qualification to ensure they are applying standards consistently throughout assessment activities. IQAs must have, and maintain, an appropriate level of technical competence and be qualified to make both marking and quality assurance decisions through a teaching qualification or recent, relevant experience.

Age restrictions

This qualification is approved for learners aged 16 – 19, 19+.

Employer involvement

Employer involvement is essential to maximise the value of each learner's experience. Centres are required to involve employers in the delivery of the Certificate of Technical Competence and/or their assessment, for every learner. This must be in place or planned before delivery programmes begin and available to the EQA for inspection and monitoring.

3 Administration

Approved centres must have effective quality assurance systems to ensure valid and reliable delivery and assessment of qualifications. Quality assurance includes initial centre registration by City & Guilds and the centre's own internal procedures for monitoring quality assurance procedures.

Consistent quality assurance requires City & Guilds and its associated centres to work together closely; our Quality Assurance Model encompasses both internal quality assurance (activities and processes undertaken within centres) and external quality assurance (activities and processes undertaken by City & Guilds).

For this qualification, standards and rigorous quality assurance are maintained by the use of:

- internal quality assurance

In order to carry out the quality assurance role, Internal Quality Assurers (IQAs) must have and maintain an appropriate level of technical competence and have recent relevant assessment experience. For more information on the requirements, refer to *Section 2: Centre requirements* in this handbook.

To meet the quality assurance criteria for this qualification, the centre must ensure that the following procedures are followed:

- suitable training of staff involved in the assessment of the qualification to ensure they understand the process of marking and standardisation
- completion by the person responsible for internal standardisation of the Centre Declaration Sheet to confirm that internal standardisation has taken place
- the completion by candidates and supervisors/tutors of the record form for each candidate's work.

External quality assurance

City & Guilds will undertake external moderation activities to ensure that the quality assurance criteria for this qualification are being met. Centres must ensure that they co-operate with City & Guilds staff and representatives when undertaking these activities.

City & Guilds requires the Head of Centre to

- facilitate any inspection of the centre which is undertaken on behalf of City & Guilds
- make secure arrangements to receive, check and keep assessment material secure at all times, maintain the security of City & Guilds confidential material from receipt to the time when it is no longer confidential and keep completed assignment work and examination scripts secure from the time they are collected from the candidates to their dispatch to City & Guilds.

Malpractice

Please refer to the City & Guilds guidance notes *Managing cases of suspected malpractice in examinations and assessments*. This document sets out the procedures to be followed in identifying and reporting malpractice by candidates and/or centre staff and the actions which City & Guilds may subsequently take. The document includes examples of candidate and centre malpractice and

explains the responsibilities of centre staff to report actual or suspected malpractice. Centres can access this document on the City & Guilds website.

Examples of candidate malpractice are detailed below (please note that this is not an exhaustive list):

- falsification of assessment evidence or results documentation
- plagiarism of any nature
- collusion with others
- copying from another candidate (including the use of ICT to aid copying), or allowing work to be copied
- deliberate destruction of another's work
- false declaration of authenticity in relation to assessments
- impersonation.

These actions constitute malpractice, for which a penalty (eg disqualification from the assessment) will be applied.

Where suspected malpractice is identified by a centre after the candidate has signed the declaration of authentication, the Head of Centre must submit full details of the case to City & Guilds at the earliest opportunity. Please refer to the form in the document *Managing cases of suspected malpractice in examinations and assessments*. Alternatively please complete the form, JCQ/M1. Copies of this form can be found on the JCQ website: http://www.jcq.org.uk

Access arrangements and special consideration

We have taken note of the provisions of equalities legislation in developing and administering this specification.

We can make arrangements so that candidates with disabilities, special educational needs and temporary injuries can access the assessment. These arrangements must be made before assessment takes place.

It is the responsibility of the centre to ensure at the start of a programme of learning that candidates will be able to access the requirements of the qualification.

Please refer to the *JCQ access arrangements and reasonable adjustments and Access arrangements - when and how applications need to be made to City & Guilds* for more information. Both are available on the City & Guilds website: **http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments**

Special consideration

We can give special consideration to candidates who have had a temporary illness, injury or indisposition at the time of the examination. Where we do this, it is given after the examination.

Applications for either access arrangements or special consideration should be submitted to City & Guilds by the Examinations Officer at the centre. For more information please consult the current version of the JCQ document, *A guide to the special consideration process*.

Language of examinations

City & Guilds has a responsibility to ensure that candidates can be assessed in the following languages only:

- English
- English in Northern Ireland
- English in Wales.

4 Units

Unit 204 Problematic plants, pests and diseases in Agriculture

Level:	2
GLH:	10

What is this unit about?

The purpose of this unit is for learners to be able to identify and suggest appropriate control methods for a range of problematic plants, pests and diseases encountered in the agricultural industry.

Learning outcomes

In this unit, learners will be able to:

1. Understand the relevance of legislation, codes of practice, industry guidance and health and safety requirements affecting the control of problematic plants, pests and diseases in Agriculture
2. Know problematic plants, pests and diseases in Agriculture and their impacts
3. Know the methods of control for problematic plants, pests and diseases in Agriculture and the requirements for reporting, record keeping and monitoring.

Scope of content

This unit covers a range of weeds (plants not required in the crop that have a serious impact on production; also plants which are potentially injurious to agricultural workers and the general public/consumers), livestock (including Equines) and potentially on the environment, pests (serious pests that impact on crop production and could impact on public health) and diseases (serious diseases that impact on crop production, agricultural workers and public health).

Learning outcome:

1. Understand the relevance of legislation, codes of practice, industry guidance, health and safety requirements affecting the control of problematic plants, pests and diseases in Agriculture

Topics:

1.1 Legislation which may affect the control of problematic plants, pests and diseases
1.2 Codes of practice and industry guidance relating to the control of problematic plants, pests and diseases.
1.3 Health and safety requirements when controlling problematic plants, pests and diseases
1.4 Personal Protective Equipment (PPE) requirements

Topic 1.1

Legislation which may affect the control of problematic plants, pests and diseases in agriculture and the implications of the legislation on their activities:

- Health and Safety at Work Act (HASAWA) 1974
  - Duties imposed on the employee
- Provision and Use of Work Equipment Regulations (PUWER) 1998
  - Regular checks and maintenance of equipment must be carried out according to manufacturer's recommendations
- Management of Health and Safety at Work Regulations 1999
  - Risk assessments must be completed and communicated to all relevant persons
- Manual Handling Operations Regulations (MHOR) 1992
  - Avoid manual handling where possible, use safe lifting techniques
- Control of Substances Hazardous to Health (COSHH) 2002 (as amended 2005)
  - Protection from substances known to be hazardous to health
- Personal Protective Equipment Regulations (PPE) 1992
  - PPE must be provided and worn
- Health & Safety (First Aid) Regulations 1981
  - Need for an accident book and knowledge of where it is kept
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013:
  - Certain categories of injuries must be reported, where first aid and seven days off is necessary
- Environmental Protection Act 1990
  - Contaminated material is regarded as waste and must be managed accordingly
- Control of Pesticide Regulations 1986
  - Any person using pesticides must take all reasonable precautions to protect the health of human beings, creatures and plants, safeguard the environment and in particular avoid the pollution of water
- Wildlife and Countryside Act 1981
  - The primary legislation which protects animals, plants and certain habitats in the UK

- The Weeds Act 1959
    - Under the act it is an offence to permit plants to grow on farmland

Topic 1.2

Codes of practice and industry guidance on the identification and control of problematic plants, pests and diseases:

- Animal and Plant Health Agency (APHA) guidance on identification and control of Japanese knotweed
    - Guides to identify Japanese knotweed and methods of control
- Environment Agency – Managing Japanese Knotweed on Development Sites
    - The knotweed code of practice contains general information on managing knotweed
- DEFRA Code of Practice on How to Prevent the Spread of Ragwort
    - Advice and guidance on identification and control of ragwort
- Environment Agency - *Guidance for the control of non-native weeds in or near fresh water*
    - Advice and guidance for the control of non-native weeds
- GB Non-native Species Secretariat
    - Advice and guidance for all non-native species
- Agricultural and Horticultural Development Board (AHDB)
    - Advice and guidance on identification and control of problematic plants, pests and diseases

Topic 1.3

The health and safety requirements when controlling problematic plants, pests and diseases:

- Generic risk assessment
- Site specific risk assessment
- Hazard identification and control
- Safe systems of work
- Control of Substances Hazardous to Health (COSHH) 2002 (as amended 2005)
- Signage and labelling
- Safe use of machinery and equipment
- Safe storage of equipment
- Welfare and hygiene procedures

Topic 1.4

Personal Protective Equipment (PPE) which may be required for controlling problematic plants, pests and diseases:

- Safety footwear
- Coveralls
- Gloves
- Head protection
- Face protection
- Respiratory Protective Equipment (RPE)
- Ear protection
- Eye protection
- Other Personal Protective Equipment (PPE) deemed suitable subject to risk assessment

Learning outcome:

2. Know problematic plants, pests and diseases in Agriculture and their impacts

Topics

2.1 Problematic plants and their impact
2.2 Problematic pests and their impact
2.3 Problematic diseases and their impact

Topic 2.1

Problematic plants by either botanical or common name and the impact in an agricultural situation:

- For all plants problems there are financial implications
- *Fallopia japonica (Japanese knotweed)*
  - Invasive. Smothers native plants by outgrowing them. Dominates habitat preventing native flora and fauna access. Rhizomes cause disturbance and erosion of riverbanks and watercourses.
- *Impatiens glandulifera (Himalayan balsam)*
  - Invasive. Smothers native plant species along watercourses and in damp areas.
- *Pteridium aquilinum (Bracken)*
  - Dominates habitat, spreading long distances due to strong rhizomes. Toxic to livestock.
- *Senecio jacobaea (Common Ragwort)*
  - An injurious weed so a legal obligation to control. Toxic to grazing livestock both in the sward and in conserved fodder. Grows in challenging environments.
- *Cirsium vulgare (Spear thistle)*
  - An injurious weed so a legal obligation to control. Produces large numbers of seeds and very persistent – particularly in grassland and waste areas.
- *Cirsium arvense (Creeping thistle)*
  - An injurious weed so a legal obligation to control. Can quickly dominate vegetation in grassland or waste ground by spread of underground root systems.
- *Rumex obtusifolius (Broad leaved dock)*
  - An injurious weed so a legal obligation to control. Grows in meadows, pastures, ditches, on waste ground and neglected cultivated ground. Can dominate ground, particularly where there has been heavy treading by stock.
- *Rumex crispus (Curled dock)*
  - An injurious weed so a legal obligation to control. Grows on verges, waste ground and arable land.
- *Avena fatua* (Wild oat)
  - Reduces crop yield when growing in a cereal crop. Germinates only from seed and easily spread by harvesting machinery.
- *Alopecurus myosuroides* (Black grass)

Most problematic arable weed in the UK with very high seed production. Resistance from many selective herbicides, yield-robbing.

- Any other problematic plants appropriate to the local or regional environment

Topic 2.2

Problematic pests by either botanical or common name and explain the impact in an agricultural situation:

- For all serious pest problems there are financial implications
- *Deroceras reticulatum* (Grey field slug)
  - Seed hollowing, leaf shredding or complete leaf loss.
- *Psylliodes chrysocephala* (Cabbage stem flea beetle)
  - Shot-holing on both the cotyledons and young developing leaves. Larvae can migrate into stem, damaging the growing point. Growth severely checked and in some cases complete plant loss.
- *Phyllotreta spp.* (Flea beetle)
  - Shot-holing on both the cotyledons, stems and young developing leaves. Growth severely checked and in some cases complete plant loss.
- *Myzus persicae* (Peach potato aphid)
  - Vectors of turnip yellow virus (TuYV)
- *Globodera rostochiensis and G. pallida* (Potato cyst nematode)
  - Larvae disrupt the root's ability to function normally. Substantial yield loss.
- Any other problematic pests appropriate to the local or regional environment

Topic 2.3

Problematic diseases by either pathogen or common name and explain the impact in an agricultural situation:

- For all serious disease problems there are financial implications
- *Fusarium spp. and Microdochium nivale* (Fusarium)
  - Foot rot, seedling blight and ear blight. Mycotoxin production in the grain which is toxic to animals and humans.
- *Mycosphaerella graminicola* (syn. Septoria tritici)
  - Large areas of necrotic brown tissue on leaves. Yield losses of up to 50%.
- *Phytophthora infestans (Blight)*
  - Watery rot of leaves, lesions on stems. Rotten tubers on growing plant or may appear during storage
- Any other problematic disease appropriate to the local or regional environment

Learning outcome:

3. Know the methods of control for problematic plants, pests and diseases in Agriculture and the requirements for reporting, record keeping and monitoring

Topics

3.1 Control of problematic plants
3.2 Control of problematic pests
3.3 Control of problematic diseases
3.4 Reporting requirements
3.5 Record keeping requirements
3.6 Monitoring of sites following control

Topic 3.1

Control methods for problematic plants:

- *Fallopia japonica (Japanese knotweed)*
  - Use of approved herbicides. Excavation and disposal off-site. Soil sterilisation. Use of root barriers to prevent spread.
- *Impatiens glandulifera (Himalayan balsam)*
  - Cutting of young plant. Use of approved herbicides.
- *Pteridium aquilinum (Bracken)*
  - Excavate. Use of approved herbicides. Can hand pull (rogue) or burn but unlikely to eradicate it.
  - Rolling of emergent stems
- *Senecio jacobaea (Common Ragwort)*
  - Use of approved herbicide. Hand pull (rogue), bag and remove from site.
- *Cirsium vulgare (Spear thistle)*
  - Cutting prior to seed shed. Use of approved herbicides. Excavate.
- *Cirsium arvense (Creeping thistle)*
  - Repeated cutting. Crop rotations. Use of approved herbicides. Avoid cultivations as can increase number of root pieces from which new shoots develop.
- *Rumex obtusifolius (Broad leaved dock)*
  - Use of approved herbicides. Hand pull (rogue) if small numbers.
- *Rumex crispus (Curled dock)*
  - Use of approved herbicides. Hand pull (rogue) if small numbers.
- *Avena fatua* (Wild oat)
  - Use of approved herbicides. Crop rotations (break crops) can give more opportunities for control. Hand pull (rogue) before seed is shed. Clean harvesting machinery following harvesting an infested field.
- *Alopecurus myosuroides* (Black grass)
  - Use of approved herbicides. Crop rotations (break crops) give more opportunity for control through use of different herbicide groups. Stale seedbeds. Spring cropping. Delayed drilling.

Topic 3.2

Control methods for problematic pests:

- *Deroceras reticulatum* (Grey field slug)
  - Seedbed consolidation. Use of approved molluscicides. Burying or removal of residue from previous crop.
- *Psylliodes chrysocephala* (Cabbage stem flea beetle)
  - Approved insecticidal seed treatments
  - Use of approved insecticides when damage seen and/or thresholds reached.
- *Phyllotreta spp.* (Flea beetle)
  - Approved insecticidal seed treatments
  - Use of approved insecticides when damage seen and/or thresholds reached.
- *Myzus persicae* (Peach potato aphid)
  - Use of approved insecticides when thresholds reached.
- *Globodera rostochiensis* and *G.* pallida (Potato cyst nematode)
  - Resistant varieties. Use of approved nematicides.

Topic 3.3

Control methods for problematic diseases:

- *Fusarium spp.* and *Microdochium nivale* (Fusarium)
  - Seed dressing. Burial of previous crop residues prior to sowing. Timely use of 'ear wash' fungicide – particularly when weather conditions are wet during flowering.
- *Mycosphaerella graminicola* (*Syn Septoria tritici*)

- Resistant varieties. Adopt a rigorous fungicide programme.

- *Phytophthora infestans (Blight)*
  - Removal of affected material. Cutting of stalks and removal of debris. Rotation intervals. Use of fungicides.

Topic 3.4

The requirements for reporting of identification and control:

- Legal obligations
- To safeguard human health (e.g. injurious pests, pathogens and plants)
- Assurance requirements
- Resistance monitoring
- So that the appropriate actions may be carried out in a timely manner

Topic 3.5

The records required to comply with legislation and industry best practice:

- Environmental assessment
- COSHH and risk assessment
- Pesticide treatment records
- Treatment records other than pesticides
- Stock records
- Waste transfer notes
- Assurance records

Topic 3.6

The requirements for monitoring the site following control:

- To meet legal obligations
- To ascertain the effectiveness of the control method
- Control method may not achieve required result.

Suggested learning resources

Books

Invasive Species Management — Clout, M; Williams, P
Published by: Oxford University Press, 2009
ISBN: 9780199216338

Journals and magazines

Farmers Weekly
Crops

Websites

GB Non-Native Species Secretariat — www.nonnativespecies.org

Health and Safety Executive (HSE)	www.hse.gov.uk
Chemicals Regulation Directorate (CRD)	www.pesticides.gov.uk
Crop Protect	https://croprotect.com/discover/reporting

Unit 205 Problematic plants, pests and diseases plants in amenity horticulture

Level:	2
GLH:	10

What is this unit about?

The purpose of this unit is for learners to recognise a range of problematic plants, pests and diseases that can occur on amenity sites, many of which are classified as invasive/injurious flora and fauna. Some present significant issues when they arise, causing substantial damage to the environment, infrastructure and services, which can lead to considerable financial impact. Learners will be able to recognise the damage they may cause. Occasionally they can be physically injurious to members of the public and operatives carrying out activities on amenity sites.

Learners undertaking this unit will know the correct reporting procedures; the necessity of implementing precautions to protect themselves and others; what control measures may be appropriate when dealing with these problems and why maintaining biosecurity is important. They will know the main pieces of legislation and understand their impact on activities to control problematic plants, pests and diseases in amenity horticulture situations.

Learning outcomes

In this unit, learners will be able to

1. Understand the relevance of legislation affecting health and safety, waste disposal, biosecurity and codes of practice relevant to working in the amenity sector.
2. Know examples of problematic plants, pests and diseases and the adverse impacts on human health, the environment and infrastructure.
3. Know methods of prevention and control of problematic plants, pests and diseases and the importance of reporting and monitoring.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand the relevance of legislation affecting health and safety, waste disposal, biosecurity and codes of practice relevant to working in the amenity sector.

Topics

1.1 Legislation affecting health and safety of the person dealing with the problem and others that may be affected

1.2 Legislation designed to protect the environment

1.3 Relevant codes of practice and guidance relating to the control of problematic plants, pests and diseases

Topic 1.1

Legislation which may affect the control of problematic plants, pests and diseases on amenity sites and the implications of the legislation on their activities:

- Health and Safety at Work Act (HASAWA) 1974
  - Duties imposed on the employee
- Provision and Use of Work Equipment Regulations (PUWER) 1998
  - Regular checks and maintenance of equipment must be carried out according to manufacturer's recommendations, safe use of machinery and equipment
- Management of Health and Safety at Work Regulations 1999
  - Risk assessments must be completed and communicated to all relevant persons, safe systems of work
- Manual Handling Operations Regulations (MHOR) 1992
  - Avoid manual handling where possible, use safe lifting techniques
- Control of Substances Hazardous to Health (COSHH) 2002 (as amended 2005)
  - Protection from substances known to be hazardous to health
- Personal Protective Equipment Regulations (PPE) 1992
  - PPE must be provided and worn:
    - Safety footwear
    - Coveralls
    - Gloves
    - Head protection
    - Face protection
    - Respiratory protective equipment (RPE)
    - Ear protection
    - Eye protection
    - Any other protective equipment deemed suitable subject to risk assessment
- Health & Safety (First Aid)Regulations 1981
  - Need for an accident book and knowledge of where it is kept
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013
  - Certain categories of injuries must be reported, where first aid and seven days off is necessary
- Control of Pesticide Regulations 1986

- Any person using pesticides must take all reasonable precautions to protect the health of human beings, creatures and plants, safeguard the environment and in particular avoid the pollution of water

Topic 1.2

Legislation designed to protect the environment in relation to problematic plants, pests and diseases on amenity sites and the implications of the legislation to include statutory Plant Health Notices, movement restrictions and Plant Passports:

- The Weeds Act 1959
  - It is an offence to permit plants listed in the Act to grow on farming or adjacent land
- The Wildlife and Countryside Act 1981
  - Primary legislation which protects animals, plants and certain habitats in the U.K. (it shall be an offence under part II of Schedule 9 to plant or grow 'Japanese Knotweed')
- Natural Environment and Rural Communities Act 2006
  - Gives power to DEFRA to go on to land and control plants listed in the Species Order as plant species of National concern
- Anti-social Behaviour, Crime and Policing Act 2014
  - This enables community protection notices to be served by local authorities or the Police against individuals who are acting unreasonably and who persistently or continually act in a way that has a detrimental effect on the quality of life of those in the locality
  - These powers are designed to be flexible and could be used to address specific problems caused by widespread species such as Japanese knotweed
- Environmental Protection Act 1990
  - Contaminated material is regarded as waste and must be managed accordingly, (any soil contaminated with 'Japanese Knotweed' is classed as controlled waste)
  - It is an offence to dispose of contaminated waste without a license. In addition it is an offence to allow contaminated soil to be transported and spread on another site
- The Waste Management Licensing Regulations 1994
  - Require that waste is recovered or disposed of "without endangering human health and without processes or methods which could harm the environment and in particular without risk to water, air, soil, plants or animals; or causing nuisance through noise or odours or adversely affecting the countryside or places of special interest"
- The Hazardous Waste Regulations 2005
  - Contain provisions about handling and movement of waste
  - Whilst untreated 'Japanese Knotweed' is not classed as hazardous waste, treated material containing certain herbicides, may be classified as hazardous waste

Topic 1.3

Codes of practice and guidance relating to the control of problematic plants, pests and diseases:

- FERA
  - The Risk Register and guidance on specific current pests and diseases including fact sheets and Pest and Disease Alerts
- Animal, Plant and Health Agency (APHA)
  - Guidance on identification and control of Knotweed. Photographs of the different stages, biodiversity effects, management of Japanese Knotweed
- Royal Institute of Chartered Surveyors Guidance
  - Japanese Knotweed and Residential Property. The Legal position, the need to identify Japanese Knotweed, guidance on landowners liability, the need for a professional survey, advice to the Council for Mortgage Lenders/Building Society Association/Association of British Insurers

- DEFRA Code of Practice on How to Prevent the Spread of Ragwort
  - Advice and guidance on identification and control of ragwort
- Environment Agency
  - Guidance for the control of non-native weeds in or near fresh water and advice and guidance for the control of non-native weeds
- GB Non-native Species Secretariat
  - Advice and guidance for all non-native species
- Agricultural and Horticultural Development Board (AHDB)
  - Advice and guidance on identification and control of problematic plants, pests and diseases.

Learning outcome:

2. Know examples of problematic plants, pests and diseases and the adverse impacts on human health, the environment and infrastructure

Topics

2.1 Identification of plants
2.2 Identification of problematic pests
2.3 Identification of the effect on plant growth of problematic diseases
2.4 Possible impact of injurious plants on human health
2.5 Possible impact of injurious pests on human health
2.6 Possible impact of invasive weeds on the environment and infrastructure

The topics in this outcome can be delivered in conjunction with each other.

Topic 2.1

Identification of plants by botanical or common name and where different stages are listed:

- *Cabomba caroliniana* (Fanwort/Carolina Water-shield)
- *Azolla filiculoides* (Water Fern)
- *Pastinaca sativa* (Wild Parsnip)
- *Heracleum mantegazzianum* (Giant Hogweed)
  - Basal rosette
  - Flowering stem and seed head
- *Fallopia japonica* (Japanese Knotweed)
  - Winter/dead stems
  - Spring shoots
  - Summer growth/flowers
  - Autumn stems (sterile seed-head)
  - Rhizomes
- *Fallopia sachalinensis* (Giant Knotweed)
- *Fallopia x boehemica* (Hybrid Knotweed)
- *Impatiens glandulifera (Himalayan Balsam)*
  - Basal rosette
  - Flowering stem and seedpods
- *Pistia stratiotes* (Water Lettuce)
- *Myriophyllum aquaticum* (Parrot's Feather)
- *Hydrocotyle ranunculoides* (Floating Pennywort)
- *Saggitaria latifolia* (Duck Potato)
- *Senecio jacobaea* (Oxford Ragwort)
  - Basal rosette

- Flowering stem and seed head
- *Ludwigia peploides* (Floating Water Primrose)
- *Ludwigia grandiflora* (Water Primrose)
- *Ludwigia uruguayensis* (Water Primrose)
- *Crassula helmsii* (Australian Swamp Stonecrop/New Zealand Pygmy Weed)

Topic 2.2

Identification of pests:

- Plant pests and where different stages of the life cycle are listed
- Where the pest is undertaking a specifically recognised activity
- The presence can be indicated by characteristic damage

Pests:

- Aphid species: *Eriosoma lanigerum* (Woolly Aphid) and others
- *Cameraria ohridella* (Chestnut Leaf Miner)
- *Euproctis chrysorrhoea* (Brown Tailed Moth)
  - Adult Moth
  - Caterpillar
  - Overnight Habitat 'Web'
  - Over-wintering habitat 'Web'
- Otiorhyncus sulcatus (Vine Weevil)
- *Parthenolecanium corni* (Brown Scale Insect)
- *Yponomeuta species* (Ermine Moth)
- *Thaumetopoea processionea* (Oak Processionary Moth)
  - Adult Moth
  - Caterpillar
  - Overnight Defensive Ball
- *Sciurus carolinensis (Grey Squirrel)*

Topic 2.3

Typical damage resulting from amenity plants being infected by serious diseases only and where different stages are listed:

- *Armillaria species* (Honey Fungus)
  - Mycelium (smell)
  - Mushrooms
  - Rhizomorphs
- *Apiogomonia veneta* (Anthracnose Disease)
- *Erwinia amylovora* (Fireblight)
- *Erysiphe species* (Powdery Mildews)
- *Hymenoscyphus fraxineus* (Ash Dieback, Ash Chalara Dieback))
- *Ophiostoma ulmi* (Dutch Elm Disease)
  - to include signs of the presence of *Scolytus multistriatus* (Elm Bark Beetle)
- *Phytophthora ramorum* (Ramorum disease "Sudden Oak Death")
- *Phytophthora kernoviae* (no common name)
- *Pseudomonas syringae aesculi* (Chestnut Bleeding Canker)
- *Puccinia species* (Rusts)

Verticillium dahliae or *Verticillium albo-atrum* (Verticillium Wilts)

Topic 2.4

The impact of injurious plants on human health:

- *Heracleum mantegazzianum* (Giant Hogweed)
  - Contact with hairs on the leaves and stems cause skin irritation
  - Contact with sap causes skin blistering and 'burning'
  - Skin becomes photosensitive following contact with the sap, which can last up to 12 months (in some cases)
- *Pastinaca sativa* (*Wild parsnip)*
  - Contact with the sap causes blistering and in some cases severe skin damage (splitting of the skin/skin lesions)
- *Euphorbia* species (Spurges)
- contact with sap causes skin blistering and 'burning'
- skin becomes photosensitive following contact with the sap
- *Ruta graveolens* (Rue)
  - Contact with sap causes skin blistering and 'burning'
  - Skin becomes photosensitive following contact with the sap
- *Aconitum napellus* (Monkshood)
  - Toxic if eaten
  - Harmful via skin contact (Anaphylaxis)
  - All parts of the plant can cause severe or fatal poisoning

Topic 2.5

The impact of injurious pests on human health:

- *Euproctis chrysorrhoea* (Brown Tailed Moth)
  - Inhalation of the hairs can cause respiratory problems
  - Contact with hairs causes eye irritation and skin rashes
- *Thaumetopoea processionea* (Oak Processionary Moth)
  - Hairs cause severe eye inflammation, swelling and in some cases closure of the eye
  - Causes severe skin irritation
- *Ixodes scapularis* (ticks)
  - Lyme disease causes skin infection, rash, flu-like symptoms, joint problems, heart problems, nerve and brain problems which may lead to paralysis and even death

Topic 2.6

The impacts of invasive weeds on the environment/ infrastructure:

- *Impatiens glandulifera* (Himalayan Balsam)
  - Smothers native plant species along watercourses and in damp areas
- *Cabomba caroliniana* (Fanwort/Carolina Water-shield)
- An aquatic plant that completely covers the water surface smothering native aquatic plant species
- *Azolla filiculoides* (Water Fern)
- An aquatic plant that completely covers the water surface smothering native aquatic plant species
- *Senecio jacobaea* (Oxford Ragwort)
  - A biennial pioneer plant with the capability to grow in challenging environments. Poisonous to horses and ruminants (sheep and cattle)
- *Fallopia sachalinensis* (Giant Knotweed)
- *Fallopia x boehemica* (Hybrid Knotweed)
- *Fallopia japonica* (Japanese Knotweed)

- The effects on the environment may include smothering native plants by effectively outgrowing them, dominating the habitat preventing native flora and fauna access and, the rhizomes cause disturbance and erosion of riverbanks and watercourses which can result in a loss of soil and in some cases blockage
- Damage to the infrastructure may include damage to river banks/watercourses, (retaining structures, walls, channels, emergence through the hard surfaces causing damage, breaking up tarmac, dislodging rigid and flexible paving units, penetrating and dislodging aggregate surfaces, pressure from the growing rhizomes cause movement to walls and structures and the rhizomes penetrate foundations, entering buildings).

- *Pistia stratiotes* (Water Lettuce)
  - An aquatic plant that completely covers the water surface, smothering native aquatic plant species
- *Myriophyllum aquaticum* (Parrot's Feather)
  - An aquatic plant that completely covers the water surface, smothering native aquatic plant species
- *Hydrocotyle ranunculoides* (Floating Pennywort)
  - A very aggressive aquatic plant that completely covers the water surface, smothering native aquatic plant species
- *Saggitaria latifolia* (Duck Potato)
  - An aquatic plant that completely covers the water surface smothering native aquatic plant species
- *Ludwigia peploides* (Floating Water Primrose)
- *Ludwigia grandiflora* (Water Primrose)
- *Ludwigia uruguayensis* (Water Primrose)
  - An aquatic plant that completely covers the water surface, smothering native aquatic plant species (resistant to Glyphosate because of its waxy cuticle)
- *Crassula helmsii* (Australian Swamp Stonecrop/New Zealand Pygmyweed)
  - A very aggressive aquatic plant that completely covers the water surface, smothering native aquatic plant species
- *Euproctis chrysorrhoea* (Brown Tailed Moth)
  - Caterpillar defoliates trees and shrubs (usually in the family Rosaceae)
- *Thaumetopoea processionea* (Oak Processionary Moth)
  - Caterpillar defoliates Quercus species

Learning outcome:

3. Know methods of prevention and control of problematic plants, pests and diseases and the importance of reporting and monitoring

Topics

3.1 Prevention and control of plants
3.2 Difficulties in fully controlling Fallopia species
3.3 Prevention and control of problematic pests
3.4 Prevention, mitigation and control of problematic diseases
3.5 Importance of reporting injurious plants, pests and diseases
3.6 Keeping auditable records and the need for ongoing monitoring

Topic 3.1

Preventing the spread of plants and suitable methods of control:

- *Impatiens glandulifera* (Himalayan Balsam)
  - At basal rosette stage, the young plant can be strimmed or mown
  - At flowering stage, application of an approved herbicide
- *Cabomba caroliniana* (Fanwort/Carolina Water-shield)
  - Application of a herbicide approved for aquatic use
- *Azolla filiculoides* (Water Fern)
  - Application of a herbicide approved for aquatic use
- *Senecio jacobaea* (Oxford Ragwort)
  - At basal rosette stage year 1, an application of a selective herbicide
  - At flowering stage year 2, hand pull, bag and remove from site
- *Pastinaca sativa* (Wild Parsnip)
  - Spot treatment with an approved herbicide
- *Heracleum mantegazzianum* (Giant Hogweed)
  - At basal rosette stage during year 1, application of an approved herbicide
  - At flowering stage in year 2, remove flower heads to prevent distribution of seed
  - Prior to or at flowering stage in year 2, application of an approved herbicide
  - At no stage must this plant be mown or strimmed because it volatilises the sap
  - Any activity to be carried out wearing full Personal Protective Equipment (PPE) which must include, full face visor, waterproof coverall, spray gauntlets and boots conforming to CE regulations
- *Fallopia sachalinensis* (Giant Knotweed)
- *Fallopia x boehemica* (Hybrid Knotweed)
- *Fallopia japonica* (Japanese Knotweed)
  - Bare soil (absence of buildings and infrastructure):
    - Use of appropriate approved pesticides
    - Use of sprayer/applicator where appropriate
    - In mixed woodland and shrub beds
- Use of appropriate approved pesticide (with adjuvant if appropriate)
- Use of sprayer/applicator where appropriate avoiding off target application
  - On hard surfaces:
    - Requires Environmental Agency Approval before application
    - Undertake and environmental risk assessment prior to application
    - Use of appropriate approved pesticide (with adjuvant if appropriate)
    - Use of sprayer/applicator where appropriate avoiding off target application
    - In or near water sources (groundwater source protection zones), courses, ponds, lakes/lochs, rivers, streams
    - Cut down the stem of the plant
    - Use of appropriate approved pesticide (with adjuvant if appropriate)
    - Use of stem injection equipment to treat the crown avoiding off target application
  - Development sites:
    - Excavate soil containing roots and rhizomes and dispose of the soil off site to an approved landfill facility. Excavators and vehicles to be cleaned/decontaminated
    - Excavate and bury on site below 5m providing that the waste is encapsulated in a membrane
    - Excavate, wind row (turning soil to stimulate growth to provide a target for pesticide application) and chemical treatment on root proof membranes
    - Use of heat for soil sterilisation
    - Use of appropriate approved pesticide (with adjuvant if appropriate)

    - Use of stem injection equipment to treat the crown avoiding off target application
- *Pistia stratiotes* (Water Lettuce)
    - Application of a herbicide approved for aquatic use
- *Myriophyllum aquaticum* (Parrot's Feather)
    - Application of a herbicide approved for aquatic use
- *Hydrocotyle ranunculoides* (Floating Pennywort)
    - Physical removal by dredging during the growing season. Plants must be left at the side of the water for 24 hours to allow aquatic fauna to return to the water
    - Application of a herbicide approved for aquatic use
- *Saggitaria latifolia* (Duck Potato)
    - Application of a herbicide approved for aquatic use
- *Ludwigia peploides* (Floating Water Primrose)
- *Ludwigia grandiflora* (Water Primrose)
- *Ludwigia uruguayensis* (Water Primrose)
    - Application of a herbicide approved for aquatic use
- *Crassula helmsii* (Australian Swamp Stonecrop/New Zealand Pygmy weed)
    - Physical removal by dredging during the growing season. Plants must be left at the side of the water for 24 hours to allow aquatic fauna to return to the water
    - Application of a herbicide approved for aquatic use
    - Re-application will be necessary to effect control

Topic 3.2

The reasons why gaining full control of Fallopia species is not always possible:

- Fallopia species can often be misidentified and can be confused with:
    - *Cornus alba* (Dogwood)
    - *Persicaria affinis* (Himalayan Fleece Flower)
    - *Lycesteria formosa* (Pheasant Berry)
    - *Rubus idaeus* (Wild Raspberry)
- Fallopia species can be spread by the following means:
    - Cutting down and transporting stems to another site, where it takes root and grows
    - Excavation of soil contaminated with rhizomes and/or stems and distribution across the site, moving soil contaminated with rhizomes and/or stems
    - Poor site hygiene, parts of the plant being transported on earth moving machinery, vehicles and footwear
    - Transportation in watercourses
- Fallopia species are resilient and resistant to treatment methods
- Regeneration may occur from rhizomes away from the treatment site (up to 11m)
- Treatment may be required over a period of up to 5 years to effect total eradication

Topic 3.3

Preventing, mitigating and controlling serious pests:

- Prevention
    - Sourcing of plants and awareness of pest and disease risks, quarantine of newly purchased plants before planting out in the environment to avoid contamination
- Mitigation
    - Prompt action and implementation of strict protocols to ensure safe disposal of infested plant material
- Controls
    - Specific to life cycle/activity of pest

Aphid species

- Addition of recommended biological control when threshold level is reached
- Application(s) of approved insecticide

Cameraria ohridella (Chestnut Leaf Minor)

- Application of an approved insecticide

Eriosoma lanigerum (Woolly Aphid)

- Early spring when colonies are small
- Removal by scrubbing with a stiff brush
- Application(s) of an approved insecticide

Euproctis chrysorrhoea (Brown Tailed Moth)

Caterpillar

- In the winter/spring, the web-like structures that the caterpillar is in over winter is physically removed and bagged and incinerated. Operatives are required to wear full PPE (as for pesticide application) to prevent contact with caterpillar hairs
- In late spring/early summer treatment with an approved insecticide to control the caterpillars
- In late spring/early summer, in the early morning the web-like structures that the caterpillar created for overnight protection are physically removed and bagged and incinerated. Operatives are required to wear full PPE (as for pesticide application) to prevent contact with caterpillar hairs

Adult Moth

- Mid to late summer treatment with an approved insecticide

Otiorhyncus sulcatus (Vine Weevil)

- Pick off adult Vine Weevils by hand
- August to September - application of recommended biological control *Steinernema kraussei (a nematode)* applied as a drench to the soil to control larvae

Parthenolecanium corni (Brown Scale Insect)

- Removal by scrubbing with a stiff brush
- Application(s) of an approved pesticide

Yponomeuta species (Ermine Moth)

- Pheromone traps
- Application(s) of an approved pesticide

Thaumetopoea processionea (Oak Processionary Moth)

Caterpillar

- In the spring when the caterpillars are evident on the foliage treat with an approved insecticide
- Operatives are required to wear full PPE to prevent contact with caterpillar hairs
- Caterpillars in overnight nests can be controlled by:
    - Vacuum removal, operatives are required to wear full PPE to prevent contact with the hairs including a respirator
    - Treated with aerosol glue or lacquer to prevent dispersal of the hairs. Physical removal of the nest into a container or bag and incinerated
    - On severe infestation the tree may have to be felled and burnt on site.
    - It is possible to control caterpillars as soon as they are evident with a biological control *Bacillus thuringiensis*; a repeat application is required after 7-10 days

Adult Moth

- The adult moths can be controlled by the use of pheromone traps from July to the end of August

Sciurus carolinensis (Grey Squirrel)

- Trapping
- Shooting

Topic 3.4

Preventing, mitigating and controlling of serious diseases:

- Prevention
  - Quarantine of newly purchased plants before planting out in the environment to avoid contamination
- Mitigation
  - Prompt action and implementation of strict protocols to ensure safe disposal of infected plant material
- Control
  - Specific to the disease

Armillaria species (Honey Fungus)

- Mycelium
- Mushrooms
- Rhizomorphs
- If Honey Fungus is confirmed, the only effective remedy is to excavate and destroy, by burning or landfill, all of the infected root and stump material. This will destroy the food base on which the rhizomorphs feed and they are unable to grow in the soil when detached from infected material.

Apiogomonia veneta (Anthracnose Disease)

- Sweep up and burn fallen leaves if this is practicable
- On young, small trees it may be possible to prune out affected twigs or branches
- Plant resistant cultivars
- Application(s) of an approved broad spectrum fungicide

Erwinia amylovora (Fireblight)

- Prune out infected growth, well below point of infection
- Destroy infected trees and shrubs
- On high value ornamentals during blossom, off label recommendation include: sprays of terramycin, streptomycin and other approved products

Erysiphe species (Powdery Mildews)

- Application(s) of an approved broad spectrum fungicide at the appropriate time

Hymenoscyphus fraxineus (Ash Dieback, Ash Chalara Dieback)

- Destroy infected trees

Ophiostoma ulmi (Dutch Elm Disease), to include signs of the presence of *Scolytus multistriatus* (Elm Bark Beetle)

- Plant resistant cultivars (*Ulmus americana* 'Princeton' ,*Ulmus 'Nanguen'* and *Ulmus* 'Sapporo Autumn Gold')
- Fell and destroy infected trees
- Application of fungicide annually only to heritage trees

Phytopthera ramorum (Ramorum disease "Sudden Oak Death")

Phytopthera kernoviae ("Bleeding Canker")

- Report suspected cases to the Animal and Plant Health Agency (APHA). For established woodland trees, the Forestry Commission

- Destroy infected trees/shrubs once infection is confirmed

Pseudomonas syringae aesculi (Chestnut Bleeding Canker)

- Trees can recover from infection
- Remove infected/dead branches as they may be subject to sudden fracture to minimise danger
- Remove and destroy dead trees

Puccinia species (Rusts)

- Application(s) of an approved broad spectrum fungicide at the appropriate time

Verticillium dahliae or *Verticillium albo-atrum* (Verticillium Wilts)

- Reduce water stress by watering infected plant
- Feed infected plant to induce vigour
- Drench of an approved broad spectrum fungicide at first sign of infection

Topic 3.5

The requirements for reporting of injurious plants, pests and serious diseases:

- Legal obligations
- To safeguard human health
- So that the appropriate actions may be carried out in a timely manner

Topic 3.6

The records required to comply with legislation and industry best practice:

- Environmental assessments
- COSHH and risk assessments
- Stock records
- Pesticide or other treatment records
- Waste transfer notes

The requirements for ongoing monitoring in all of the following situations:

- To meet contractual obligations
- To ascertain the effectiveness of the treatment
- Where there is a likelihood of a recurrence after treatment

Guidance for delivery

This unit should be delivered in an Amenity Horticulture context. Learners will benefit from having access to sites where some of the problem plants (weeds), pests and diseases are in evidence. Wherever possible, learners should be provided with live or preserved specimens for identification purposes, although the use of high quality colour images is acceptable.

Primary research can be carried out online, the use of a PowerPoint and workbook to guide learning is recommended. Talks given by industry experts will be of considerable benefit and will expand the breadth and depth of learning.

Controls are not expected to be actually implemented as part of this unit, but learners are expected to be aware of the range of controls involved in the problems that are studied.

This unit links with City and Guilds NPTC suite of pesticide qualifications for example: the Level 2 Principles of Safe Handling and Application of Pesticides (Pa1) – 0216-49 and the Level 2 Award in the Safe Application of Pesticides using Pedestrian Hand Held Equipment (PA6) – 0216-54

Suggested learning resources

Books

Field Guide to Invasive Plants and Animals in Britain Published by: Bloomsbury Publishing PLC ISBN-13: 9781408123188	Booy, O, Wade, M and Roy, H
Invasive Species Detection, Impact and Control Published by: Nova Science Publishers Inc. ISBN-13: 9781606922521	Wilcox C.P & Turpin R. B.
Invasive Species Management Published by: Oxford University Press, 2009 ISBN: 9780199216338	Clout, M; Williams, P
The Royal Horticultural Society Pests and Diseases Published by: Dorling Kindersley Ltd ISBN-13: 9781405341776	Halstead, A &, Greenwood, P
Pests, Diseases and Disorders of Garden Plants Published by: Collins ISBN: 9780007387168 ISBN 10: 0007387164	Buczacki, S & Harris, K

Journals and magazines

Horticulture Week

Websites

The Non Native Species Secretariat	www.nonnativespecies.org
The Royal Horticultural Society	www.rhs.org.uk
Law and Your Environment	www.environmentlaw.org.uk

Natural England, Department for Environment, Food & Rural Affairs and Environment Agency	www.gov.uk/prevent-the-spread-of-harmful-invasive-and-non-native-plants
GB Non-Native Species Secretariat	www.nonnativespecies.org
Non Native Specialist association	www.innsa.org
Health and Safety Executive (HSE)	www.hse.gov.uk
Chemicals Regulation Directorate (CRD)	www.pesticides.gov.uk
Horticulture Week On Line Edition	www.hortweek.com
Government plant health advice	www.gov.uk/guidance/plant-health-controls
The risk register	https://secure.fera.defra.gov.uk/phiw/riskRegister

Unit 206 Problematic plants, pests and diseases in the environment and countryside

Level:	2
GLH:	10

What is this unit about?

The purpose of this unit is for learners to recognise a range of weeds, pests and diseases that may arise in the countryside and areas such as nature reserves; to know the associated reporting procedures and to be aware of precautions and control measures that may be necessary and appropriate.

Learners undertaking this unit can expect to identify a range of native and non-native invasive weeds, pests and diseases and ask why these are important in natural areas; recognise the damage that may be caused and the consequences of failing to report or control the problem; understand personal and general safety when working with problem weeds, pests and diseases and their control. They will be able to ask why biodiversity matters in these situations and what their role is in maintaining biodiversity and bio-security. They will know the main areas of legislation that are involved when dealing with problem weeds, pests and diseases.

Learning outcomes

In this unit, learners will be able to

1. Understand the relevance of legislation affecting health and safety, waste disposal and bio-security, and Codes of Practice relevant to the countryside and environmental sector
2. Know problematic plants, pests and diseases and the adverse impacts that these may cause
3. Know methods of prevention and control of problematic plants, pests and diseases and the importance of reporting and monitoring them

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand the relevance of legislation affecting health and safety, waste disposal and bio-security, and Codes of Practice relevant to the countryside and environmental sector

Topics

1.1 Health and Safety legislation
1.2 Environmental protection legislation

Topic 1.1

Legislation that affects safe working for themselves and others in work situations:

- Health and Safety at Work Act 1974: Every employee
  - Must take care of their own health and safety and that of other people, who may be affected by what they do or don't do at work
  - Must cooperate with an employer or anyone else to ensure that all aspects of health and safety are complied with
  - Must not interfere with or misuse or interfere with anything provided for health and safety
- Personal Protective Equipment Regulations 1992
  - Require that employees are provided with specific personal protective equipment, that these are worn as and when required, that replacements are requested when necessary
- Provision and Use of Work Equipment Regulations 1998
  - Require that tools and equipment are used for tasks, and in ways, for which they were intended and that the user has been trained in correct use
- Manual Handling Operations Regulations 1992
  - Require that handling aids are used if appropriate and available and that manual handling and lifting conforms to correct practice
- Control of Substances Hazardous to Health Regulations 2002 (as amended 2005)
  - Requires that use of any substances that are hazardous are risk-assessed and users are aware of the risks and use any control measures that are identified
- Management of Health and Safety at Work Regulations 1999
  - Requires that risk assessments are carried out for all tasks that take place at work, that these risk assessments are understood by operatives and required actions are taken

Topic 1:2

Environmental Protection Legislation:

- Food and Environment Protection Act 1985
  - Requires that pesticides are used safely, humanely and without causing environmental harm; within this are detailed requirements explained within the Control of Pesticides Regulations 1986
- Environment Protection Act 1990, 1995 (including Waste Regulations 2011 and others)
  - Covers a wide range of aspects relating to pollution of land, sea and air, hazardous waste transport and disposal and licensing

- Weeds Act 1959 and amendments
  - Requires that certain specified weeds are controlled in appropriate ways to prevent their spread
- Wildlife and Countryside Act 1981 (including the Sale of Invasive Non-native Plants Order 2014)
  - Specifically preventing the spread and sale of particular plants
- Plant Health Act 1967
  - Including various more recent orders within the scope of this that specify particular problems

Learning outcome:

2. Know problematic plants, pests and diseases and the adverse impacts that these may cause

Topics

2.1 Invasive plants
2:2 Injurious plants
2.3 Pests
2.4 Diseases

This learning outcome covers identifying invasive and injurious plants, pests and diseases and the specific problems and related impacts.

Topic 2.1

Identifying invasive plants, the specific problems and related impacts:

- Invasive plants – native weeds
- *Circaea lutetiana* (Enchanter's nightshade)
- *Cirsium species* (Thistle)
- *Crataegus monogyna* (hawthorn)
- *Equisetum arvense* (horsetail)
- *Pteridium aquilinum* (bracken)
- *Rumex species* (Dock)
- *Rubus fruticosus* (bramble)
- *Senecio jacobaea* and other species (Ragwort)

- Invasive plants – non-native and introduced weeds
- *Acer pseudoplatanus* (Sycamore)
- *Azolla filiculoides* (Water fern)
- *Crassula helmsii* (Australian Swamp Stonecrop)
- *Impatiens glandulifera* (Himalayan Balsam)
  - Introduced as an ornamental plant in the 19th Century, the 'exploding' seed pods mean that it rapidly spread into the wild, where it is particularly adapted to damp environments and river banks. Its dense growth can rapidly out-compete native flora, and its annual habit leads to bank erosion.
- *Ludwigia grandiflora* etc (Water primrose)
- *Lysichiton americanum* (Skunk Cabbage)
- *Myriophyllum aquaticum* (Parrot's feather)
- *Rhododendron ponticum* (purple rhododendron)
- *Robinia pseudoacacia* (False Acacia)
- *Prunus laurocerasus* (cherry laurel)

Topic 2.2
Identifying injurious plants, the specific problems and related impacts (this is not an exhaustive list):

- *Atropa belladonna* (Deadly Nightshade)
- *Digitalis purpurea* (Foxglove)
- *Euonymus spp*. (Spindle)
- *Euphorbia spp*. (Spurge)
- *Heracleum mantegazzianum* (Giant Hogweed)
    - Native of eastern Europe and Asia, member of the family Apiaceae, introduced as an ornamental plant, but now widespread in moist areas in particular, including canal sides, riverbanks and similar; the sap, which is phototoxic, is released by brushing against the hairs on the stems and leaves, causing severe blisters and long-lasting scars, which can remain painfully debilitating for many months and years
- *Mercurialis perennis* (Dog's Mercury)
- *Rhamnus cathartica* (Buckthorn)
- *Solanum dulcamara* (Wood Nightshade)
- *Taxus baccata* (Yew)
- *Urticaria urens* (Stinging nettle)
- *Pastinaca sativa* (Wild parsnip)

Topic 2.3
Identifying pests, the specific problems and related impacts (examples appropriate to the countryside or natural situation should be used; the following must be covered)

- Native pests with severe impacts
- *Yponomeuta spp*. - Ermine moth
- Non-native and introduced pests with severe impacts
- *Anoplophora species* - Longhorn beetles
- *Cameraria ohridella* - Chestnut leaf miner
- *Cervus nippon* – Sika deer
- *Dryocosmus kuriphilus* - Oriental chestnut gall wasp
- *Harmonia axyridis* - Harlequin Ladybird: an Asian species that is larger, more aggressive and more voracious than native species, and which may also predate on the native species; increasing numbers of this species seems to be linked directly to rapid declines in native species such as two-spotted ladybird.
- *Myocastor coypus* - Coypu
- *Pacifastacus leniuculus* - American signal crayfish
- *Sciurus carolinensis* - Grey squirrel

Topic 2.4
Identifying diseases, the specific problems and related impacts:

- Native diseases with severe impacts
- *Erwinia amylovora* - Fireblight
- *Erysiphe species* - Powdery mildew

- *Puccinia species* - Rust
- Non-native and introduced diseases with severe impacts
- *Apiognomonia veneta* - Anthracnose on plane
- *Hymenoscyphus fraxineus* - Ash dieback (Ash Chalara dieback); recent (2012) introduction from Europe, this fungal disease causes leaf loss, crown dieback and bark lesions, and is often directly or indirectly fatal, particularly to younger trees
- *Ophiostoma ulmi* - Dutch elm disease
- *Phytophthora ramorum, P kernoviae*
- *Pseudomonas syringae aesculi* - Chestnut bleeding canker

Learning outcome:

3. Know methods of prevention and control of problematic plants, pests and diseases and the importance of reporting and monitoring them

Topics

3.1 Methods of prevention, mitigation and control
3.2 Precautions to be taken
3.3 Reporting and record keeping
3.4 Monitoring

This learning outcome covers preventing, mitigating the effects of or controlling the problems that have been identified and described in outcome two, recommending suitable safe practices at all times. The necessity of keeping auditable records and of ongoing monitoring to ensure that the controls have been effective are also within this outcome.

Topic 3.1

Methods of prevention:

- Quarantine
  - Newly purchased or acquired plants maintained in a separate area prior to planting in the environment to avoid contamination of the final site and surrounding natural areas and monitored for a specified period before planting – useful means of reducing risk of introduction
- Phytosanitary inspection
  - Used with or without quarantine as a detailed health check of stock before movement on or off a site

`Methods of mitigation:

- Use of resistant cultivars as they become available as a means to minimise particular problems
- Biocides and disinfectants – used on tools, equipment and vehicles as they are moved between planting and maintenance sites

Methods of control:

- Cultural
- Effective weed management by a control strategy which prevents weeds setting seed or rooting across
- Effective physical barriers to prevent weed seed entering sites; may include hedges and shelter-belts for confined sites

- Rolling, timed pulling, digging out and other physical management processes to prevent the spread of specific plants
- Biological controls
- use of introduced parasites or predators as they become available for the control of specific problems
- Pheromone traps to monitor and indicate timing and need for control of various pests
- Chemical sprays, drenches, granules, controlled droplet application, injection as appropriate to situations; examples to be given for situations appropriate to the problems
- Incineration
- where appropriate to the problem, licenses may be required
- Transport off site
- contaminated materials disposed of professionally by landfill or enclosed incineration by specialized contractors; transport secure against accidental release; movement license may be required
- Burial
    - for specified weeds burial in enclosed, lined landfill at specified depths may be a suitable means of disposal

Topic 3.2

Precautions that can be taken**:**

- When handling potentially injurious plants, pests and diseases you must take into account the safety of the operative, the wider public including other colleagues, and the safety of the wider environment including bio-diversity and wildlife.
- Consideration should include:
    - Use of PPE appropriate to the situation involved; for injurious plants this may include complete skin protection (Giant Hogweed); for control of certain pests full body protection including respirators may be required (Oak Processionary Moth). Codes of practice and COSHH / Risk Assessments to be adhered to for each specified control measure in place. Adequate account of the season and weather conditions must be considered in these situations.
- Use of chemicals only allowed by qualified operatives or when directly supervised by a qualified operative
- Licenses required for movement or disposal of certain specified problems

Topic 3.3

Reporting procedures:

- Pesticide application records – legislative requirement and providing traceability of what activities have taken place
- COSHH and Risk Assessments – ensuring that safe practices in terms of tasks, use and storage of hazardous materials etc., are being undertaken
- Product traceability – ensuring compliance with what is being grown, bought, moved and disposed of throughout the life of all aspects of the products (including waste products and treatments)
- Waste transfer notes – covering hazardous and non-hazardous wastes disposed of on or off-site
- Lines of communication – what aspects should be reported before actions are taken, after actions have been taken; who needs to be informed within the organisation (line managers, supervisors) and outside the organisation (statutory and non-statutory bodies); this will have a particular relevance to new and unknown problems (weeds and invasive / injurious plants, pests, diseases) with which the learner is unfamiliar.

Topic 3.4

The requirements for further monitoring of the following situations:

- Recurrence of pests and diseases following treatments
- Recurrence of weed and invasive plants after controls have been applied
- Appropriate frequencies of monitoring in different situations

Suggested learning resources

Websites

IUCN Invasive Species group	www.issg.org
Invasive non-native species framework strategy for Great Britain 2008	www.nonnativespecies.org
RHS – search Advice, invasive plants	www.rhs.org.uk
Department of Environment, Food and Rural Affairs (Defra)	https://secure.fera.defra.gov.uk/phiw/riskRegister
The Woodland Trust	https://www.woodlandtrust.org.uk/
Non Native Species Secretariat	http://www.nonnativespecies.org/
The National Archives	http://www.legislation.gov.uk/
Law and Your Environment	http://www.environmentlaw.org.uk/
Health and Safety Executive	http://www.hse.gov.uk/
Forest Research	http://www.forestry.gov.uk/
Environment Agency	https://www.gov.uk/government/organisations/environment-agency
Horticulture Week on-line edition	http://www.hortweek.com

Unit 207 Problematic plants, pests and diseases in floristry

Level:	2
GLH:	10

What is this unit about?

The purpose of this unit is for learners to identify invasive parts of plants: roots, stems leaves, flowers, berries (seed), pests and diseases that are potentially harmful to humans and their health, the damage to the environment, financial implications, physically injurious to florist or customers, the damage caused and precautions and control methods encountered within the floral industry.

Learning outcomes

In this unit, learners will be able to

1. Understand the legislation requirements relating to the impact on the floral industry, Code of Practice and industry guidance within the florist premises when handling and discovering invasive plants, pests and diseases
2. Know parts of a plant which are invasive, injurious, poisonous, problematic pests and diseases and the impact of the problems
3. Know methods of prevention and control, suitable precautions for handling potentially harmful and injurious parts of plants and record keeping

Scope of content

This unit covers identification of poisonous/dangerous parts of a plant: root, stems leaves flowers, berries (seed) and pests and diseases. The importance of correct handling of the hazard, reporting and monitoring, the relevance of the legislation affecting retail sales such as cut flowers, plants, gift work, weddings, funeral designs and corporate work. Health and Safety practice relating to harmful plants, roots, stems, leaves, flowers, berries (seed) and pest and diseases. How to deal with ways of protection to reduce risks which includes the knowledge of safe disposal of hazardous, dangerous roots, stems, leaves, flowers, berries, pests and diseases.

Learning outcome:

1. Understand the legislation requirements relating to the impact on the floral industry, Code of Practice and industry guidance within the florist premises when handling/discovering invasive plants, pests and diseases.

Topics

1.1 Legislation which may affect the supply, retail and control of flowers and plants

1.2 Code of Practice and industry guidance relating to information to florists and the public

1.3 Risk assessment relating to legislation (Act), identifying potential hazards within a florist business and potential fresh stock for retail.

1.4 Identify the potential impact on a florist business and within the floral industry of invasive plants, pests and diseases.

Topic 1.1

Legislation which may affect or is relevant to the receiving of flowers and plants from the wholesale supplier, to be handled by the florist and to be retailed to the public:

- Health and Safety at Work Act (HASAWA) 1974
- Duties imposed on the employee
- Provision and Use of Work Equipment Regulations (PUWER) 1998
- Regular checks and maintenance of equipment must be carried out according to manufacturer's recommendations, safe use of machinery and equipment
- Management of Health and Safety at Work Regulations 1999
- Risk assessments must be completed and communicated to all relevant persons, safe systems of work
- Manual Handling Operations Regulations (MHOR) 1992
- Avoid manual handling where possible, use safe lifting techniques
- Control of Substances Hazardous to Health (COSHH) 2002 (as amended 2005)
- Protection from substances known to be hazardous to health
- Plants contain sap and oils that may cause severe skin reactions and dermatitis (itching, rashes, blistering).
- Wet work can cause skin disorders to develop, correct PPE is essential when handling harmful plants, flowers and pests and diseases relating to the floral industry
- Personal Protective Equipment Regulations (PPE) 1992
- PPE must be provided and worn:
  - Safety footwear
  - Coveralls
  - Gloves
  - Head protection
  - Face protection
  - Respiratory protective equipment (RPE)
  - Ear protection

  - Eye protection
  - Any other protective equipment deemed suitable subject to risk assessment

- Health & Safety (First Aid)Regulations 1981
- Need for an accident book and knowledge of where it is kept
- Sale of Goods Act
- These laws are aimed at safeguarding consumers by ensuring that goods offered for sale are reasonably safe, and meet certain standards of quality to make them fit for their intended use.
- Environmental Protection Act 1990
- Contaminated material regarded as waste and managed accordingly
  - Waste commonly defined as containing substances or possessing properties that may make it harmful to human health or the surrounding environment

Topic 1.2

Code of practice and guidance for the floral industry, which provides information indicating the seriousness of the harm that certain flowers and plants can do:

- Institute of Professional Florist (British Florist Association)
  - Plants and flowers that have been identified as being significant hazards
- Horticultural Trades Association
  - Plant labelling in three categories which is recommended according to severity of the hazard.
- Animal and Plant Health Agency (APHA) guidance on control of Knotweed
  - Guides to identify knotweed and methods of control
- Environmental Agency – Managing Japanese Knotweed

Topic 1.3

Potential hazards associated with fresh plant material:

- The plant
- Pests present
- Pathogens present

Topic 1.4

The potential financial consequences for the business and floral industry of not adhering to good practice and legal requirements:

Business:

- Loss of business
- Insurance claims
- Loss of reputation

Industry:

- More regulation
- Increased vigilance

Learning outcome:

2. Know parts of a plant which are invasive, injurious, poisonous, problematic pests and diseases and the impact of the problems

Topics

2.1 Identify plants that are potentially harmful and the harmful effects
2.2 Identify indicators of serious pests and diseases
2.3 Hazard assessment

Topic 2.1

Plants that are a potential risk to health and public safety, retailed and used within the floral industry, and the harmful effects:

- *Aconitum napellus* (Monkshood)
  - Toxic if eaten/ harmful via skin, all parts of plant can cause severe or fatal poisoning
- *Arum italicum* (Cuckoo Pint)
  - Toxic if eaten/skin and eye irritant
- *Colchicum autumnale* (Autumn Crocus)
  - Toxic if eaten
- *Convallaria majalis* (Lily of the Valley)
  - Toxic if eaten
- *Dieffenbachia picta* (Dumb Cane)
  - Toxic if eaten/skin and eye irritant
- *Digitalis purpurea* (Foxglove)
  - Toxic if eaten
- *Euphorbia spp.* (except E. pulcherrima) (Spurge)
  - Skin and eye irritant/ toxic if eaten
- *Gloriosa rothschildiana* (Flame Lily)
  - Toxic if eaten
- *Primula obconica* (Primula)
  - May cause skin allergy/ causes respiratory problems – can be fatal
- *Ricinus communis* (Castor Oil Plant)
  - Toxic if eaten
- *Taxus baccata* (Yew)
  - Toxic if eaten
- *Veratrum nigrum* (Hellebore)
  - Toxic if eaten
- *Aucuba japonica* (Spotted Laurel/ Japanese Laurel)
- *Aglaonema spp.* (Chinese Evergreens)
  - Harmful if eaten/skin and eye irritant
- *Aloe spp.* (Aloe)
  - Harmful if eaten
- *Allium spp.* (Onion)
  - All parts of the plant emit pungent smell that is associated with members of the Allium family. Culinary onions are the bulbs of the plant. Ramsons (Allium ursinum) and onions themselves are the members of this family most frequently involved in cases of poisoning.

  - Confusion can occur when storing onion bulbs, such as daffodils, which can cause poisoning when eaten
- *Alstromeria peruviana* (Alstromeria)
  - May cause skin allergy such as a contact dermatitis
- *Amaryllis belladonna* (Belladonna)
  - Harmful if eaten
- *Anthurium andreanum* (Flamingo Flower)
  - Harmful if eaten/ skin and eye irritant
- *Arachniodes adiantiformis* (Leather Leaf Fern)
  - Contact with fronds bearing spores may cause dermatitis
- *Asparagus spp.* except A. officinalis (*Asparagus Fern*)
  - May cause skin allergy/ fruits harmful if eaten
- *Caladium spp.* (Angel's Wings)
  - Harmful if eaten/skin and eye irritant
- *Capsicum annuum* (ornamental cultivar) (Chilli Pepper)
  - Skin and eye irritant/harmful if eaten
- *Chrysanthemum spp.* (Chrysanthemum)
  - May cause skin allergy
- *Clivia miniata*
  - Harmful if eaten/skin irritant, similar to Daffodil poisoning.
- *Chlorophytum comosum* (Spider Plant)
  - Harmful if eaten/may cause skin allergy
- *Cupressocyparis leylandii* (Leyland Cypress)
  - May cause skin allergy
- *Delphinium elatum* (Larkspur)
  - Harmful if eaten
- *Euonymus europaeus* (Spindle Tree)
  - Harmful if eaten
- *Fagus sylvatica* (*Beech)*
  - It is only the seed (nuts) that are likely to cause human poisoning
- *Fallopia japonica* (Japanese Knotweed)
  - Invasive. Smothers aggressively native plants by outgrowing them, over whelming other garden plants. Dominates habitat
  - Preventing native flora and fauna access
  - Rhizomes cause disturbance and erosion of river banks, watercourses and takes over household gardens
- *Ficus benjamina* (Weeping Fig)
  - May cause skin allergy
- *Ficus carica* (Common Fig)
  - Skin irritant with sunlight
- *Hedera spp.* (Ivy*)*
  - Harmful if eaten/may cause skin allergy
- *Helleborus niger* (Christmas Rose)
  - Harmful if eaten/skin irritant
- *Hippeastrum spp.* (Amaryllis)
  - Harmfull if eaten
- *Hyacinthoides non-scripta* (Bluebell)
  - Harmful if eaten
- *Hydrangea spp*
  - If large amounts eaten can cause cyanide poisoning
- *Hayacinthus orientalis* (Common Hyacinth)

  - Harmful if eaten/skin irritant
- *Ilex aquifolium* (Holly)
  - Berries harmful if eaten
- *Hypericum perforatum (*St John's Wort)
  - Harmful if eaten
- *Iris spp.*
  - Harmful if eaten
- *Ligustrum ovalifolium* (Garden Privet)
  - Harmful if eaten
- *Lupinus spp.* (Lupin)
  - Harmful if eaten
- *Monstera deliciosa* (Cheese Plant)
  - Harmful if eaten/skin and eye irritant
- *Narcissus spp.* (Daffodil)
  - Harmful if eaten/skin irritant, whole plant.
- *Ornithogalum thyrsoides* (Star of Bethlehem)
  - Harmful if eaten
- *Papaver somniferum* (Poppy)
  - Harmful if eaten
- *Passiflora caerulea* (Passion Flower)
  - Harmful if eaten
- *Philodendron spp.* (Philodendron)
  - Harmful if eaten/skin and eye irritant
- *Polygonatum x hybridum* (Solomons Seal)
  - Harmful if eaten
- *Prunus laurocerasus* and *lusitanica* (Cherry Laurel and Portugal Laurel)
  - Seed kernels harmful if eaten
- *Rhus diversiloba*, (Poison Oak)
  radicans, rydbergil striata, succedanea, toxicarum, verniciflua and vernix
  - Poisonous if eaten. Skin contact commonly causes severe blistering dermatitis
- *Scindapsus aureus* (Devil's Ivy)
  - Toxic if eaten/skin and eye irritant
- *Schefflera actinophylla* (Umbrella Plant)
  - May cause skin allergy, can cause burning and swelling of the mouth and throat,
- *Solanum spp.* (cultivated ornamental species except S.dulcamara)
  - Harmful if eaten
- *Spathiphyllum wallisii* (Peace Lily)
  - Harmful if eaten/skin and eye irritant
- *Symphoricarpos spp.* (Snowberry)
  - Harmful if eaten
- *Tulipa spp.* (Tulip)
  - Harmful if eaten/may cause skin allergy
- *Viscum album* (Mistletoe)
  - Leaves, stems and berries are poisonous, stomach problems
- *Zantedeschia aethiopica* (Arum Lily/ Calla Lily)
  - Harmful if eaten/skin and eye irritant

The health issues related to plant material or its parts:

- Allergic reactions
  - Eye irritant, toxic if eaten

- Contact – such as touch
  - Skin irritant
- Respiratory
  - Can affect breathing, such as asthma, or throat and be fatal
- Thorns and sharp points
- Pollens and spores

Other issues related to plant material or its parts:

- Poisonous to pets and other animals
- Damage to clothing, furniture and furnishings
- Plants that smother
  - Japanese Knotweed
  - Presence of unknown organisms, diseases and substances

Topic 2.2

Symptoms of serious pest and diseases to parts of the plant:

- Foliage:
  - Leaf spots
  - Rusts
  - Moulds
  - Mildews
  - Pest damage
  - Discoloration
  - Abnormalities
  - Disorders
- Flowers:
  - Moulds
  - Mildews
  - Pest damage
  - Discoloration
  - Distortion
  - Disorders
- Stems:
  - Rusts
  - Moulds
  - Mildews
  - Pest damage
  - Discoloration
  - Abnormalities
  - Disorders
- Berries/ fruit/ seed pods:
  - Rusts
  - Moulds
  - Mildews
  - Pest damage
  - Discoloration

- Abnormalities
- Disorders

Topic 2.3

Hazard assessment of the plant material:

- Botanical plant name
- Common plant name
- Type of hazard
- Colour code indicating severity of hazard
- Potential consequences
- Precautions

Learning outcome:

3. Know methods of prevention and control, suitable precautions for handling potentially harmful and injurious parts of plants and record keeping

Topics

3.1 Method of reporting and timescale regulations

3.2 Methods of precautions for handling, prevention and control

Topic 3.1

The importance of identifying, reporting and implementing precautions in line with the Florist Business Code of Practice:

- Correct identification of plant is essential so that hazards can be defined and appropriate precautions implemented
- Reporting to a senior manager, in a designated timescale – business policy
- Legal obligations
- If applicable, notification to local authority and organisations (depending on the risk/hazard)

Topic 3.2

Suitable methods for handling, selling and disposing of potentially harmful plant and other material:

- Handling:
  - Use of correct PPE when handling floral deliveries
    - Awareness of any hazardous materials on delivery
    - Documentation – records of current suppliers (wholesale flowers and plants supplier to enable traceability)
- Selling:
  - Awareness
    - signage on display stand
    - identification/ information to consumers at point of sale or receipt of goods
    - informative care cards for specific hazards
- Disposal:
  - Correct Disposal and Control
    - Fallopia species (Japanese Knotweed)

Guidance for delivery

Suggested guidance delivery, to include clear images of hazardous materials that could be supplied to a florist business by the wholesalers.

Clear understanding of action, recording and legislation that will affect the business.

Links with the horticultural unit within this qualification relating to Pests and Diseases.

Employer engagement

Employer engagement is essential in order to maximise the value of learners' experience. A partnership approach should be adopted where possible, with employers with whom the consortium has links, and with employers used for work experience placements.

It would be helpful for teachers to develop a method of maintaining contact with a range of employers in the sectors who may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content up to date.

Suggested learning resources

Books

Poisonous Plants and Fungi an Illustrated Guide Published by: TSO (The Stationery Office), 2003 ISBN: 011 7028614	Cooper,M.R; Johnson, A.W; Dauncey,E.A
Poisonous Plants: A Guide for Parents and Childcare Published by: Royal Botanical Gardens	Dauncey,E.A
Poisonous Plants A Handbook for Pharmacists, Doctors, Toxicologists, Biologist and Veterinarians	Frohne, D

Websites

Royal Horticultural Society	www.rhs.org.uk

Unit 208 Problematic plants, pests and diseases in forestry, woodland management and arboriculture

Level:	2
GLH:	10

What is this unit about?

The purpose of this unit is for learners to recognise a range of pests, diseases and plants, some of which are classified as invasive/injurious flora and fauna. In some instances they can be physically injurious to members of the public and operatives working in forestry, woodland management and arboriculture situations. It is important to know the correct reporting procedures, the necessary precautions to protect themselves and others, and what control measures may be necessary and appropriate.

Learners undertaking this unit will identify a range of native and non-native pests, diseases and plants. They will know why these are important, recognise the damage they may cause and the consequences of failing to correctly identify, report or control the problem; understand the necessary safety precautions to protect themselves, the public and the environment and why maintaining biosecurity is important. They will know the main pieces of legislation and understand their impact on activities to control serious pests, diseases and invasive plants in forestry, woodland management and arboriculture situations.

Learning outcomes

In this unit, learners will be able to:

1. Understand the relevance of legislation affecting health and safety, waste disposal and biosecurity, and codes of practice relevant to working in in forestry, woodland management and arboriculture
2. Know problematic plants, pests and diseases and the adverse impacts on human health and on the environment
3. Understand methods of prevention and control of problematic plants, pests and diseases in forestry, woodland management and arboriculture and the importance of reporting and monitoring

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand the relevance of legislation affecting health and safety, waste disposal and biosecurity, and codes of practice relevant to working in forestry, woodland management and arboriculture

Topics

1.1 Legislation affecting health and safety of the person dealing with the problem and others that may be affected

1.2 Legislation designed to protect the environment

1.3 Relevant codes of practice relating to the control of problematic plants, pests and diseases

Included this outcome are pieces of legislation related to safety of the person dealing with the problem and all others who may be affected; legislation designed to protect the environment and relevant codes of practice relating to dealing with problematic plants, pests and diseases.

Topic 1.1

Legislation which may affect the control of problematic plants, pests and diseases on forestry, woodland management and arboriculture and understand the implications of the legislation on their activities:

- Health and Safety at Work Act (HSWA) 1974
  - duties imposed on the employee
- Provision and Use of Work Equipment Regulations (PUWER) 1998
  - regular checks and maintenance of equipment must be carried out according to manufacturer's recommendations, safe use of machinery and equipment
- Management of Health and Safety at Work Regulations 1999 (as amended 2006)
  - risk assessments must be completed and communicated to all relevant persons, safe systems of work
- Manual Handling Operations Regulations (MHOR) 1992
  - avoid manual handling where possible, use safe lifting techniques
- Control of Substances Hazardous to Health (COSHH) 2002 (as amended 2005)
  - protection from substances known to be hazardous to health
- Personal Protective Equipment Regulations (PPE) 1992
  - PPE must be provided and worn. This will be identified by the hazard and risk assessment process:
    - Safety footwear
    - Protective clothing
    - Coveralls
    - Gloves
    - Head protection
    - Face protection
    - Respiratory protective equipment (RPE)
    - Ear protection
    - Eye protection

- Any other protective equipment deemed suitable subject to risk assessment

- Health & Safety (First Aid)Regulations 1981 (as amended)
  - This covers the requirements of employers to have adequate first aid facility at work in the form of appropriately trained staff and first aid equipment in line with the types of work being carried out.
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013
  - Requirement for recording and reporting of injuries, diseases and dangerous occurrences (or near misses that could have resulted in injury) at work. Requires injuries, diseases and near misses that occur at work to be recorded in an accident book. Where the injury is one of the specified types of injuries in the regulations or results in seven consecutive days off work (not including the day of the injury) or affect a non-working person it should be reported to HSE. There are also eight occupational diseases that are reportable as well as 27 dangerous occurrences or near misses types. For more details see HSE guidance
- IND G453 (rev1) Control of Pesticide Regulations 1986 (COPR)(as amended up to 1997)
  - Any person using pesticides, must take all reasonable precautions to protect the health of human beings, creatures and plants, safeguard the environment and in particular avoid the pollution of water.
- Biocidal Product Regulations 2001 (BPR)(as amended)
  - a biocide is:
    - " - any substance or mixture, in the form in which it is supplied to the user, consisting of, containing or generating one or more active substances, with the intention of destroying, deterring, rendering harmless, preventing the action of, or otherwise exerting a controlling effect on, any harmful organism by any means other than mere physical or mechanical action,

    - "Any substance or mixture, generated from substances or mixtures which do not themselves fall under the first indent, to be used with the intention of destroying, deterring, rendering harmless, preventing the action of, or otherwise exerting a controlling effect on, any harmful organism by any means other than mere physical or mechanical action"

All products previously covered by COPR are now being moved over to the BPR.

Topic 1.2

Legislation designed to protect the environment in relation to problematic plants, pests and diseases on forestry, woodland management and arboriculture sites and understand the implications of the legislation on their activities:

- The Weeds Act 1959
  - It is an offence to permit plants listed in the Act to grow on farming or adjacent land
- The Wildlife and Countryside Act 1981(as amended)
  - Primary legislation which protects animals, plants and certain habitats in the U.K. (it shall be an offence under part II of Schedule 9 to plant or grow 'Japanese Knotweed')
- Environmental Protection Act 1990(as amended)
  - Contaminated material is regarded as waste and must be managed accordingly. Any soil contaminated with 'Japanese Knotweed' is classed as controlled waste or extractive waste. It is an offence to dispose of contaminated waste without a waste management license. In addition it is an offence to allow contaminated waste or extractive waste to be transported and spread on another site or even to treat, keep or deposit controlled waste or extractive waste in a way likely to cause environmental damage or harm to human health
- The Waste Management Licensing Regulations 1994 (as amended)
  - Require that waste is recovered or disposed of "without endangering human health and without processes or methods which could harm the environment and in particular without

risk to water, air, soil, plants or animals; or causing nuisance through noise or odours or adversely affecting the countryside or places of special interest". In addition there are now area specific amendments in England and Wales and Northern Ireland. In Scotland it has been replaced by the Waste Management Licensing (Scotland) Regulations 2011

- The Hazardous Waste Regulations 2005 (as amended)
  - Contain provisions about handling and movement of waste. Whilst untreated 'Japanese Knotweed' is not classed as hazardous waste, treated material containing certain herbicides, may be classified as hazardous waste. In addition the regulations are area specific for England, Wales and Northern Ireland. In Scotland it is covered by The Waste (Meaning of Hazardous Waste and European Waste Catalogue) (Miscellaneous Amendments) (Scotland) Regulations 2015, which linked hazardous waste to wider regulations.

Topic 1.3

Relevant codes of practice/industry good practise guides relating to the control of problematic plants, pests and diseases on forestry, woodland management and arboriculture sites and understand the implications on their activities:

- Natural England, Department of the Environment, Food and Rural Affairs and Environment Agency
  - Harmful weeds and invasive, non-native plants
  - Prevent them spreading
- Agricultural and Horticultural Development Board (AHDB)
  - Advice and guidance on identification and control of problematic plants, pests and diseases
- Forestry Commission
  - Forests and biodiversity - UK Forestry Standard Guidelines
  - Managing and Controlling Invasive Rhododendron
  - Advice and Guidance on how to control invasive Rhododendron
- Forestry Commission Practice Note
  - Controlling Grey Squirrel Damage to Woodlands
  - Managing Deer in the Countryside
  - The Prevention of Mammal Damage to Trees in Woodland
- DEFRA Code of Practice on How to Prevent the Spread of Ragwort
  - Advice and guidance on identification and control of ragwort
- GB Non-native Species Secretariat
  - Advice and guidance for all non-native species

Learning outcome:

2. Know problematic plants, pests and diseases and the adverse impacts on human health and on the environment

Topics

2.1 Identification of problematic plant pests
2.2 Identification of the effect on plant growth of serious diseases
2.3 Identification of plants
2.4 Possible impact of injurious pest on human health
2.5 Impact of invasive plants on the environment and infrastructure
2.6 Possible impact of injurious plants on human health

This learning outcome covers the identification of plants (weeds), pests and diseases, some of which have the potential to impact on human health, others are invasive having significant impact on the environment/infrastructure. Because of their impacts on human health and/or the environment/infrastructure, some will need to be identified at various stages of development or in the case of pests at various stages in their life cycle.

Topic 2.1

Identifying pests using the common name. Where different stages of the life cycle are listed, where the pest is undertaking a specifically recognised activity, or the presence can be indicated by characteristic damage:

- *Anoplophora glabripennis* (Asian Longhorn Beetle)
- *Cameraria ohridella* (Chestnut Leaf Minor)
- *Capreolus capreolus* (Roe Deer)
- *Cervus elaphus* (Red Deer)
- *Cervus nippon* (Sika Deer)
- *Dama dama* (Fallow Deer)
- *Dendroctonus micans* (Great Spruce bark Beetle)
- *Dendrolimus pini* (Pine Tree Lappet Moth)
- *Dryocosmus kuriphilus* (Oriental Chestnut Gall wasp)
- *Euproctis chrysorrhoea* (Brown Tailed Moth)
  - Adult Moth
  - Caterpillar
  - Overnight Habitat 'Web'
  - Over wintering habitat 'Web'
- *Lepus europaeus* (Brown Hare)
- *Oryctolagus cuniculus* (Rabbit)
- *Platypus cylindrus* (Oak Pinhole Borer)
- *Muntiacus reevesi* (Muntjac Deer)
- *Sciurus carolinensis* (Grey Squirrel)
- *Thaumetopoea processionea* (Oak Processionary Moth)
  - Adult Moth
  - Caterpillar (larvae)
  - Overnight Defensive Ball (Pupal nest)

Topic 2.2

Identifying the typical damage resulting from plants being infected by only serious diseases of plants in forestry, woodland or arboricultural situations. Where different life stages are listed, these must be covered:

- Acute Oak Decline(AOD) various bacteria have been associated with the disease as well as the wood boring Two spotted Oak buprestid Beetle (*Agrilus biguttatus)*
- *Armillaria species* (Honey fungus)
  - Mycelium (by smell)
  - Mushrooms
  - Rhizomorphs
- *Cryphonectria parasitica* (Sweet Chestnut Blight)
- *Dothistroma septosporum* (Drothistroma Needle Blight)
- *Hymenoscyphus faxineus* (Ash dieback, Chalara, Ash Chalara dieback)
- *Ophiostoma novo-ulmi* (Dutch Elm Disease), to include signs of the presence of *Scolytus multistriatus* (Elm bark Beetle) and the larger and more effective vector *Scolytus scolytus*
- *Phytophthora alni* (Phytophthora Disease of Alder)
- *Phytophthora austrocedri* (Phytophthora Disease of Juniper)
- *Phytophthora kernoviae* (no common name)
- *Phytophthora lateralis* (Cedar Root Disease)
- *Phytophthora ramorum* (Ramorum disease or Sudden Oak Death)
- *Pseudomonas syringae* pv. *aesculi* (Bleeding Canker of Horse Chestnut)
- *Splanchnonema platani* (Massaria Disease of Plane Trees)

Topic 2.3

Identifying problematic plants for forestry and arboriculture, by botanical or common name. Where different stages are listed, these must be covered:

- *Ailanthus altissima* (Tree of Heaven)
- *Cotoneaster spp.* (Cotoneaster)
- *Fallopia baldschuanica* (Russian Vine)
- *Fallopia sachalinensis* (Giant Knotweed)
- *Fallopia x bohemica* (Hybrid Knotweed)
- *Fallopia japonica* (Japanese Knotweed)
- *Heracleum mantegazzianum* (Giant Hogweed)
  - Basel rosette
  - Flowering stem and seed head
- *Hyacinthoides hispanica* (Spanish Bluebell)
- *Impatiens glandulifera* (Himalayan Balsam)
- *Lysichiton americanus* (Skunk Cabbage)
- *Prunus laurocerasus* (Cherry Laurel)
- *Prunus lusitanica* (Portuguese Laurel)
- *Rhododendron ponticum* (Rhododendron)
- *Robinia pseudoacacia* (False Acacia or Black Locust)
- *Jacobaea vulgaria* (Common Ragwort)
- *Symphoricarpos albus* (Snowberry)
- x Cuprocyparis leylandii (Leyland Cypress)

Topic 2.4

The impact of injurious pests on human health. It is anticipated that this will be undertaken in conjunction with other topics in this outcome:

- *Euproctis chrysorrhoea* (Brown Tailed Moth)
  - inhalation of the hairs can cause respiratory problems
  - contact with hairs causes eyes irritation and skin rashes
- *Thaumetopoea processionea* (Oak Processionary Moth)
  - Generally they cause a rash or in some causes severe skin irritation
  - Hairs can causes severe eye inflammation, swelling and in some cases closure of the eye

Topic 2.4

The impact of injurious plants on human health that can be found in an arboricultural or forestry environment. It is anticipated that this will be undertaken in conjunction with other topics in this outcome:

- *Heracleum mantegazzianum* (Giant Hogweed)
  - Contact with hairs on the leaves and stems cause skin irritation
  - Contact with sap causes skin blistering and 'burning'
  - Skin becomes photosensitive following contact with the sap, which can last up to 12 months (in some cases)

Topic 2.5

The impact of invasive plants on the environment and infrastructure:

- *Ailanthus altissima* (Tree of Heaven) – Forms thickets, inhibits competition by shading and through toxic chemicals that supress germination. Suckers can disrupt structures, pathways and buildings
- *Cotoneaster spp.* (Cotoneaster) - invasive, competes with native plants in woodlands causing loss of native species
- *Fallopia baldschuanica* (Russian Vine) - Overwhelms and kills shrubs and trees
- *Fallopia sachalinensis* (Giant Knotweed)
- *Fallopia x bohemica* (Hybrid Knotweed)
- *Fallopia japonica* (Japanese Knotweed)
  - The effects on the environment may include:
  - Smothers native plants by effectively outgrowing them
  - Dominates the habitat preventing native flora and fauna access
  - Rhizomes cause disturbance and erosion of riverbanks and watercourses which can result in a loss of soil and in some cases blockage
  - Damage to the infrastructure may include:
  - damage to river banks/watercourses, (retaining structures, walls, channels
  - Emergence through the hard surfaces causing damage, breaking up tarmac, dislodging rigid and flexible paving units, penetrating and dislodging aggregate surfaces)
  - Pressure from the growing rhizomes cause movement to walls and structures
  - Rhizomes penetrate foundations entering buildings
- *Hyacinthoides hispanica* (Spanish Bluebell) - hybridises with the native Bluebell, hybrids displace native Bluebell, loss of species
- *Impatiens glandulifera* (Himalayan Balsam) - smothers native plant species along watercourses and in damp areas
- *Lysichiton americanus* (Skunk Cabbage) - persistent and spreading, can dominate large areas beside ponds and streams, outcompetes the native species
- *Prunus laurocerasus* (Cherry Laurel) - shades out most other vegetation, all parts contain Cyanogenic glycosides which yield Hydrocyanic or Prussic Acid also known as Hydrogen Cyanide

- *Prunus lusitanica* (Portuguese Laurel) - supresses native woodland understory leading to loss of species
- *Rhododendron ponticum* (Rhododendron) - shades out native species in the understory of woodlands. Host for *Phytophthora ramorum*. All parts are poisonous to humans and livestock
- *Robinia pseudoacacia* (False Locust) - shades out native species, damages roads and structures. Poisonous to Horses and humans.
- *Jacobaea vulgaria* (Common Ragwort)
  - A biennial pioneer plant with the capability to grow in challenging environments. Poisonous to ruminants (horses, sheep and cattle)
- *Symphoricarpos albus* (Snowberry) – displaces native species by forming a dense thicket. Berries are poisonous to humans.
- Cupressus macrocarpa (Monterey Cypress) - significantly more dangerous than Leyland Cypress. Can cause poisoning in animals, allergic contact dermatitis in humans. Out competes other plant species.
- x Cuprocyparis leylandii (Leyland Cypress) - can cause poisoning in animals, allergic contact dermatitis in humans. Out competes other plant species

Learning outcome:

3. Understand methods of prevention and control of problematic plants, pests and diseases in forestry, woodland management and arboriculture and the importance of reporting and monitoring

Topics

3.1 Prevention and control of plants
3.2 Prevention and control of pests
3.3 Prevention, mitigation and control of diseases
3.4 Difficulties in fully controlling Fallopia species
3.5 Importance of reporting injurious plants, pests and diseases
3.6 Keeping auditable records and the need for ongoing monitoring

This outcome covers safe and appropriate methods of prevention, mitigation (where appropriate) and control of problematic plants (weeds), pests and disease focusing on invasive/injurious plants; serious pests and diseases in amenity situations whilst complying fully with legislation and industry good practice; why full control might prove difficult for Fallopia species. Describe the importance of reporting, keeping auditable records and the need for ongoing monitoring to ensure that controls have been effective.

Topic 3.1

Preventing (where appropriate) the spread of plants and suitable methods of control:

- *Ailanthus altissima* (Tree of Heaven) - fell and treat stumps with approved herbicide plugs to prevent re-growth and regrowth from roots
- *Cotoneaster spp.* (Cotoneaster) – grub out seedlings, cut down larger plants and treat stumps with herbicide plugs to prevent re-growth
- *Fallopia sachalinensis* (Giant Knotweed)
- *Fallopia x bohemica* (Hybrid Knotweed)

- *Fallopia japonica* (Japanese Knotweed)

  Bare soil:
  - Use of appropriate approved pesticides
  - Use of sprayer/applicator where appropriate

  In mixed woodland and shrub beds:
  - Use of appropriate approved pesticide with adjuvant
  - Use of sprayer/applicator where appropriate avoiding off target application

  On hard surfaces:
  - Undertake an environmental risk assessment prior to application
  - Use of appropriate approved pesticide with adjuvant
  - Use of sprayer/applicator where appropriate avoiding off target application

  In or near water sources (groundwater source protection zones), courses, ponds, lakes/lochs, rivers, streams
  - Requires Environmental Agency approval before application
  - Cut down the stem of the plant
  - Use of appropriate approved pesticide with adjuvant
  - Use of stem injection equipment to treat the crown avoiding off target application

  Development sites:
  - Excavate soil containing roots and rhizomes and dispose of the soil off site to an approved landfill facility. Excavators and vehicles to be cleaned/decontaminated
  - Excavate and bury on site below 5m providing that the waste is encapsulated in a membrane
  - Excavate, wind row (turning soil to stimulate growth to provide a target for pesticide application)and chemical treatment on root proof membranes
  - Use of heat for soil sterilisation
  - Use of appropriate approved pesticide with adjuvant
  - Use of stem injection equipment to treat the crown avoiding off target application
- *Heracleum mantegazzianum* (Giant Hogweed)
  - At base rosette stage during year 1, application of an approved herbicide
  - At flowering in year 2 stage, remove flower heads to prevent distribution of seed
  - Prior to or at flowering stage in year 2, application of an approved herbicide
  - At no stage must this plant be mown or strimmed because it volatilises the sap
  - Any activity to be carried out wearing full Personal Protective Equipment (PPE) which should include, full face visor, waterproof coverall, spray gauntlets and boots as identified in a hazard and risk assessment and in line with personal protective equipment Regulations
- *Hyacinthoides hispanica* (Spanish Bluebell)
  - Dig up (once positively identified) leave on the surface to dry out and die
- *Impatiens glandulifera* (Himalayan Balsam)
  - At basal rosette stage the young plant can be strimmed or mown
  - At flowering stage application of an approved herbicide
- *Lysichiton americanus* (Skunk Cabbage)
  - An application of an approved herbicide
- *Pastinaca sativa* (Wild Parsnip)
  - Spot treatment with an approved herbicide
- *Prunus laurocerasus* (Cherry Laurel)
  - Fell and treat stumps with approved herbicide plugs to prevent re-growth
- *Prunus lusitanica* (Portuguese Laurel)
  - Fell and treat stumps with approved herbicide plugs to prevent re-growth

- *Rhododendron ponticum* (Rhododendron), there are a number of control options, which include:
  - On large areas- flail mature plants, treat stumps with an approved herbicide, treat re-growth on stumps before it reaches 1.3m in height with an approved herbicide
  - On isolated mature plants – manual cutting of stems and treat stumps with approved herbicide plugs to prevent re-growth
  - For small isolated plants treat with an overall application of an approved herbicide
  - Seedlings - hand pull seedlings before they establish
- *Robinia pseudoacacia* (False Locust)
  - Fell and treat stumps with approved herbicide plugs to prevent re-growth
- *Jacobaea vulgaria* (Common Ragwort)
  - At basal rosette stage year 1, an application of a selective herbicide
  - At flowering stage year 2, hand pull, bag and remove from site
- *Symphoricarpos albus* (Snowberry)
  - Cut down plants and spray re-growth with an approved herbicide
- x Cuprocyparis leylandii (Leyland Cypress)
  - Fell trees (re-growth from stumps unlikely)

Topic 3.2

Definitions of the terms prevention, mitigation and control and the action required for serious pests in the arboriculture and forestry industry:

- Prevention: quarantine of newly purchased plants before planting out in the environment to avoid contamination
- Mitigation: prompt action and implementation of strict protocols to ensure safe disposal of infested plant material
- Controls: specific to life cycle/activity of pest

Agrilus planipennis (Emerald Ash Borer)

- Not yet discovered in the UK, but in Europe and considered an imminent threat to Fraxinus in the U.K.

Anoplophora glabripennis (Asian Longhorn Beetle)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: http://www.forestry.gov.uk/treealert
- All infested trees and potentially infested trees within a 100m zone must be felled
- All felled trees must be incinerated. The movement of plants, logs, wood etc is subject to statutory controls.
- Residents within 2km buffer zone put on high alert.

Bursaphelenchs xylophilus (Pine Wood Nematode)

- Not yet discovered in the UK, but in Europe and considered an imminent threat

Cameraria ohridella (Chestnut Leaf Minor)

- On heritage trees an application of an approved pesticide.
- In most instance no action is taken.

Capreolus capreolus (Roe Deer)

- Fencing to exclude on young plantations.
- Shooting

Cervus elaphus (Red Deer)

- Fencing to exclude on young plantations.
- Shooting

Cervus nippon (Sika Deer)

- Fencing to exclude on young plantations.
- Shooting

Dama dama (Fallow Deer)

- Fencing to exclude on young plantations.
- Shooting

Dendroctonus micans (Great Spruce bark Beetle)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- Biological control. The use of a host-specific predatory beetle, *Rhizophagus grandis*, because *R. grandis* has an extremely well-developed ability to find its prey, together with a rapid reproductive rate, only small numbers of individuals are needed to control each new outbreak. Typically around 100 adults per site.

Dendrolimus pini (Pine Tree Lappet Moth)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- Forestry commission recommend a risk based approach, monitor Pine tree lappet Moth populations in woodlands
- Set up and monitor pheromone traps at those mills in receipt of timber
- Apply timber movement restrictions only to higher risk areas, i.e. where breeding populations have been confirmed and only in mid-May - end August when the risks of transporting egg masses and larval clusters out of the area are greatest.
- Adopt practical biosecurity measures during timber harvesting operations to reduce the risk of moving Pine tree lappet eggs and larvae outside the area.
- If necessary aerial pesticide/biological control in the unlikely event that a mass outbreak occurs.

Dryocosmus kuriphilus (Oriental Chestnut Gall wasp)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- Control options include insecticide treatment. However, insecticide treatment of widespread outbreaks in the wider environment is unlikely to be effective because the galls encase the larvae, protecting them from chemical treatments.
- Suggested control methods are felling/coppicing infected trees and burning on site, or mulching the top. Mulching (grinding the material into small fragments to destroy the pest). The timber from the trunks can then be used in a bio-secure manner, e.g. for fencing.

Euproctis chrysorrhoea (Brown Tailed Moth)

Caterpillar:

- In the winter/spring the web-like structures that the caterpillar over winters in are physically removed and bagged and incinerated. Operative are required to wear full PPE (as for pesticide application) to prevent contact with caterpillar hairs
- In late spring/early summer treatment with an approved insecticide to control the caterpillars
- In late spring/early summer, in the early morning he web-like structures that the caterpillar created for overnight protection are physically removed and bagged and incinerated. Operatives are required to wear full PPE (as for pesticide application) to prevent contact with caterpillar hairs

Adult Moth

- Mid to late summer treatment with an approved insecticide

Lepus europaeus (Brown Hare) - fencing to exclude on young plantations. Shooting

Oryctolagus cuniculus (Rabbit) - fencing to exclude on young plantations. Shooting

Platypus cylindrus (Oak Pinhole Borer)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- Manage the harvest operation with the biology of the beetle in mind, inspect all logs regularly
- Logs and timber salvaged from dying trees should always be regarded as a potential source of beetles. Spray high value logs with an insecticide approved for use on cut logs in May and July

Muntiacus reevesi (Muntjac Deer)

- Fencing to exclude on young plantations.
- Shooting

Sciurus carolinensis (Grey Squirrel)

- Fencing to exclude on young plantations.
- Shooting

Thaumetopoea pityocampa (Pine Processionary Moth) - Not known to be present in the UK, but in Europe and considered an imminent threat.

Thaumetopoea processionea (Oak Processionary Moth)

Caterpillar

- Operatives are required to wear full PPE to prevent contact with caterpillar hairs
- In the spring when the caterpillars are evident on the foliage treat with an approved insecticide
- Caterpillars in overnight nests can be controlled by;
  - Vacuum removal, operatives are required to wear full PPE to prevent contact with the hairs including a respirator
  - Treated with aerosol glue or lacquer to prevent dispersal of the hairs. Physical removal of the nest into a container or bag and incinerated. Operatives are required to wear full PPE to prevent contact with caterpillar hairs
  - On severe infestation the tree may have to be felled and burnt on site. Operatives are required to wear full PPE to prevent contact with caterpillar hairs
  - It is possible to control caterpillars as soon as they are evident with a biological control *Bacillus thuringiensis*; a repeat application is required after 7-10 days. Operatives are required to wear full PPE to prevent contact with caterpillar hairs

Adult Moth

- The adult moths can be controlled by the use of pheromone traps from July to the end of August

Topic 3.3

Definition of the terms prevention, mitigation and control and the action required for serious diseases in the arboriculture and forestry industry:

- Prevention: quarantine of newly purchased plants before planting out in the environment to avoid contamination
- Mitigation: prompt action and implementation of strict protocols to ensure safe disposal of infected plant material
- Control: specific to the disease

Acute Oak Decline (AOD) various bacteria cause the disease, but the wood boring Buprestid Beetle may be partly to blame – there are no control measures, many thousands of trees are affected. Tree is affected by multiple agents. Controls:

- Thinning of the canopy will prolong life of the tree
- Death occurs in four to six years
- Fell tree, timber may be used

Armillaria species (Honey fungus)

- Mycelium
- Mushrooms
- Rhizomorphs

If honey fungus is confirmed, the only effective remedy is to excavate and destroy, by burning or landfill, all of the infected root and stump material. This will destroy the food base on which the rhizomorphs feed and they are unable to grow in the soil when detached from infected material. *A. mellea* affects many broadleaves and Common Yew, but doesn't affect Box Elder or other conifers if considering replanting. *A. ostoyae* affects many conifers so consider broadleaf trees when replanting

Cryphonectria parasitica (Sweet Chestnut Blight)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**
- C. parasitica is treated as a European Union (EU) quarantine organism, which means that movements of planting material must be free from it, with plant passports issued to provide an assurance of compliance with requirements and to ensure traceability of the material
- Movement of round timber and isolated bark into countries with protected-zone status is not permitted unless the timber or bark has been passported and is accompanied by an official statement to show that it has been kiln dried or that the bark has been fumigated

Dothistroma septosporum (Drothistroma Needle Blight)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**
- Reducing humidity can reduce levels of infection
- Good weed control is important in young crops
- Thinning of older crops to facilitate good air movement
- Biosecurity measures implemented in areas of infection

Hymenoscyphus faxineus (Ash dieback, Ash Chalara dieback)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- Destroy infected trees

Ophiostoma ulmi (Dutch Elm Disease), to include signs of the presence of *Scolytus multistriatus or Scolytus scolytus* (Elm bark Beetle)

- Plant resistant cultivars
- Fell and destroy infected trees
- Application of fungicide annually to heritage or trees

Phytophthora alni (Phytophthora Disease of Alder)

- Avoid planting Alder on river banks that are liable to flooding and where the disease occurs presents a high risk
- Coppicing can regenerate diseased trees

Phytophthora austrocedri (Phytophthora Disease of Juniper)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- Implantation of statutory control measures
- Destruction of affected trees by burning, where practicable

- Stringent biosecurity measures

Phytophthora kernoviae (No common name)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- For established woodland trees, the Forestry Commission
- Destroy infected trees once infection is confirmed
- Implement stringent biosecurity measures

Phytophthora lateralis (Cedar Root Disease)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- For heritage and high value cultivars of Lawson's Cypress, fungicidal soil drenches may be effective
- Felling and destruction of dying/dead trees

Phytophthora ramorum (Ramorum disease or Sudden Oak Death)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**.
- Fell infected trees
- Any movement of Phytophthora-affected wood from a forest site (or subsequently move the affected material from a mill or processing site) requires a Movement License Phytophthora-affected wood may only be moved to a facility that holds a valid processing license

Pseudomonas syringae pv. aesculi (Bleeding Canker in Horse Chestnut)

- Trees can recover form infection
- Remove infected/dead branches, as they may be subject to sudden fracture to minimise danger
- Remove and destroy dead trees, generally younger trees
- Implement stringent biosecurity measures

Splanchnonema platani (Massaria Disease of Plane Trees)

- Report suspected cases to the Animal and Plant Health Agency (APHA) or Report via website: **http://www.forestry.gov.uk/treealert**
- There is no available treatment for the disease apart from removing diseased branches before they become an unacceptable safety hazard
- People who work on plane trees can help to minimise the rate of spread by practicing good biosecurity, or plant hygiene, such as cleaning and disinfecting tools, equipment, boots and outer clothing before working on other trees

Topic 3.4

Reasons why it can be challenging to gain full control of Fallopia species:

Fallopia species can often be misidentified, they can be confused with:

- *Cornus alba* (Dogwood)
- *Persicaria affinis* (Himalayan Fleece Flower)
- *Leycesteria formosa* (Pheasant Berry)
- *Rubus idaeus* (Raspberry)

Fallopia species can be spread by the following means:

- Cutting down and transporting stems to another site, where it takes root and grows

- Excavation of soil contaminated with rhizomes and/or stems and distribution across the site moving soil contaminated with rhizomes and/or stems
- Poor site hygiene, parts of the plant being transported on earth moving machinery and vehicles
- Transportation in watercourses

Fallopia species are resilient and resistant to treatment methods

- Regeneration may occur from rhizomes away from the treatment site (Up to 11m)
- Treatment may be required over a period of up to 5 years to effect total eradication

Topic 3.5

The requirements for reporting of injurious plants, pests and serious diseases:

- Legal obligations (notifiable diseases)
- To safeguard human health (injurious pests and plants)
- So that the appropriate actions may be carried out in a timely manner

Topic 3.6

The records required to comply with legislation and industry best practice:

- Environmental assessment records
- COSHH assessment records
- Stock records
- Plant passports
- Pesticide or other treatment records
- Waste transfer notes

The reasons for ongoing monitoring in all of the following situations:

- To meet contractual obligations
- To ascertain the effectiveness of the treatment - *Fallopia* species treatment may not achieve the desired result (sub-lethal Glyphosate 'bonsai' re-growth)
- Where there is a likelihood of a recurrence after treatment - *Fallopia* species are resilient and can regenerate/grow from small pieces of plant material

Guidance for delivery

This unit should be delivered in a Forestry, woodland management and arboricultural context. Learners will benefit from having access to sites where some of the problem pests, diseases or plants are in evidence. Wherever possible learners should be provided with live or preserved specimens for identification purposes, although the use of high quality colour images is acceptable.

Primary research can be carried out on line, the use of a PowerPoint and workbook to guide learning is recommended. Talks given by industry experts will be of considerable benefit and will expand the breadth and depth of learning.

Controls are not expected to be actually implemented as part of this unit, but learners are expected to be aware of the range of controls involved in the problems that are studied.

This unit links with City and Guilds Level 2 Principles of Safe Handling and Application of Pesticides (PA1) – 0216-49 and the Level 2 Award in the Safe Application of Pesticides Using Hand Held Equipment (PA6)

Suggested learning resources

Books

Tree Pests and Diseases: An Arborists' Field Guide Published by: The Arboricultural Society	Watson, G
Field Guide to Invasive Plants and Animals in Britain Published by Bloomsbury ISBN: 9781408123188	Booy, O, Wade, M, Roy, H
Invasive Species Management Published by: Oxford University Press, 2009 ISBN: 9780199216338	Clout, M; Williams, P
Poisonous Plants in Britain and their effects on Animals and Man Published by HMSO, 1984 ISBN: 0 11 242529 1	Cooper, M. and Johnson A.

Journals and magazines

The Arboricultural Journal
Forestry Journal
Horticulture Week

Websites

The Forestry Commission	www.forestry.gov.uk
The Arboricultural Association	www.trees.org.uk
The Forestry Commission - Tree Health Diagnostic and Advisory Service	www.forestry.gov.uk/fr/INFD-5UWEY6
The Woodland Trust	www.woodlandtrust.org.uk
The Non Native Species Secretariat	www.nonnativespecies.org

Natural England, Department for Environment, Food & Rural Affairs and Environment Agency	www.gov.uk/prevent-the-spread-of-harmful-invasive-and-non-native-plants
GB Non-Native Species Secretariat	www.nonnativespecies.org
Non Native Specialist Association	www.innsa.org
Health and Safety Executive (HSE)	www.hse.gov.uk
Chemicals Regulation Directorate (CRD)	www.pesticides.gov.uk
Horticulture Week On Line Edition	www.hortweek.com
International Code of Botanical Nomenclature	www.iapt-taxon.org/nomen/main.php
Observatree Project	www.observatree.org.uk

Unit 209 Problematic plants, pests and diseases in production horticulture

Level:	2
GLH:	10

What is this unit about?

The purpose of this unit is for learners to recognise a range of plants, pests and diseases that may arise in horticultural nursery situations; to know the associated reporting procedures and to be aware of precautions and control measures that may be necessary and appropriate.

Learners undertaking this unit can expect to identify a range of native and non-native invasive weeds, pests and diseases and ask why these are important in nursery situations; recognise the damage that may be caused and the consequences of failing to report or control the problem; understand personal and general safety when working with problem plants, pests and diseases and their control. They will be able to ask why bio-security matters in nurseries and what their role is in maintaining bio-security. They will know the main areas of legislation that are involved when dealing with problem weeds, pests and diseases.

Learning outcomes

In this unit, learners will be able to

1. Understand the relevance of legislation affecting health and safety, waste disposal and bio-security and Codes of Practice relevant to the nursery sector
2. Know problematic plants, pests and diseases and the adverse impacts that these may cause
3. Know appropriate methods of prevention and control of problematic plants, pests and diseases and the importance of reporting and monitoring them

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand the relevance of legislation affecting health and safety, waste disposal and bio-security and Codes of Practice relevant to the nursery sector

Topics

1.1 Health and Safety legislation
1.2 Environmental protection legislation
1.3 Trading Standards legislation
1.4 Codes of Practice
1.5 Consequences on business

In this learning outcome, legislation related to the safety of the person dealing with the problem and that of all others who may be affected; codes of practice when dealing with the problems in nursery situations; environmental and business consequences of failing to recognise or deal effectively with the problems.

Topic 1.1

Legislation that affects safe working for themselves and others in work situations:

- Health and Safety at Work Act 1974, every employee
  - Must take care of their own health and safety and that of other people, who may be affected by what they do or don't do at work
  - Must cooperate with an employer or anyone else to ensure that all aspects of health and safety are complied with
  - Must not to interfere with or misuse or interfere with anything provided for health and safety
- Personal Protective Equipment Regulations 1992
  - Require that employees are provided with specific personal protective equipment, that these are worn as and when required, that replacements are requested when necessary
- Provision and Use of Work Equipment Regulations 1998 (PUWER)
  - Require that tools and equipment are used for tasks, and in ways, for which they were intended and that the user has been trained in correct use
- Manual Handling Operations Regulations 1992
  - Require that handling aids are used if appropriate and available and that manual handling and lifting conforms to correct practice
- Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended 2005)
  - Requires that use of any substances that are hazardous are risk-assessed and users are aware of the risks and use any control measures that are identified
- Management of Health and Safety at Work Regulations (MHSWR) 1999
  - Requires that risk assessments are carried out for all tasks that take place at work, that these risk assessments are understood by operatives and required actions are taken

Topic 1.2

Environmental Protection Legislation:

- Food and Environment Protection Act 1985
  - Requires that pesticides are used safely, humanely and without causing environmental harm; within this are detailed requirements explained within the Control of Pesticides Regulations 1986
- Environment Protection Act 1990, 1995 (including Waste Regulations 2011 and others)
  - Covers a wide range of aspects relating to pollution of land, sea and air, hazardous waste transport and disposal and licensing
- Weeds Act 1959 and amendments
  - Requires that certain specified weeds are controlled in appropriate ways to prevent their spread
- Wildlife and Countryside Act 1981 (including the Sale of Invasive Non-native Plants Order 2014)
  - Specifically preventing the spread and sale of particular plants

  Plant Health Act 1967
  - Including various more recent orders within the scope of this that specify particular problems

Topic 1.3

Legislation related to trade in goods and standards:

- Sale of Goods Act 1979, requiring that anything sold from the nursery must be as described – usually therefore free from weeds, pests and diseases and of merchantable quality; also the Sale and Supply of Goods Act 1994

Topic 1.4

Industry Quality Assurance Scheme:

- British Ornamental Plant Producers (BOPP) Certification scheme 2015
  - Defines the procedures for production of ornamental plants to ensure that quality and traceability meet a wide range of clearly-defined standards appropriate to the particular crop and also to growing media. Details within this Code of Practice require that pests, diseases and weeds are monitored and that severe outbreaks are dealt with, crops or plants affected by notifiable problems are not moved or sold and that Plant Heath Inspectors are notified. Bought-in plants and plant material must be carefully monitored to ensure freedom from weeds, pests and diseases and if appropriate quarantined during the monitoring period.
- Plant Health Propagation Scheme (PHPS)
  - Is a voluntary certification scheme covering the health and quality of fruit and nut crops and bulbs

Topic 1.5

The potential financial consequences for the business of not adhering to good practice and legal requirements:

Business:

- Loss of business
- Insurance claims
- Loss of reputation

- More regulation
- Increased vigilance

Learning outcome:

2. Know problematic plants, pests and diseases and the adverse impacts that these may cause

Topics

2.1 Invasive and injurious plants
2.2 Pests
2.3 Diseases

Topic 2.1

Invasive plants – native weeds:

- *Elymus repens* (Couch grass)
  - Creeping rhizomatous grass which spreads rapidly and penetrates woven membranes due to spear-like growing tips; infiltrates roots of perennials easily; difficult to eradicate once established
- *Cardamine hirsutum* (Hairy Bittercress)
- *Cirsium spp.* (Thistle)
- *Rumex spp.* (Dock)
- *Senecio jacobaea* and other species (Ragwort)

Invasive plants – non-native and introduced weeds:

- *Azolla filiculoides* (Water fern)
- *Myriophyllum aquaticum* (Parrot's feather)
- *Ludwigia grandiflora etc* (Water primrose)
- *Crassula helmsii* (Australian Swamp Stonecrop)
- *Impatiens glandulifera* (Himalayan Balsam)
- *Acer pseudoplatanus* (Sycamore)
- *Rhododendron ponticum* (purple rhododendron)
- *Robinia pseudoacacia* (False Acacia)

Injurious plants:

- Horticultural Trades Association (HTA) list to be used and examples appropriate to the learner's situation should be recognised; this is an extensive list and the following is a selection from different production sectors:

Hardy plants:

- *Aconitum spp.* (Monkshood)
- *Daphne spp.* (Mezereon etc)
- *Digitalis purpurea* (Foxglove)
- *Euonymus spp.* (Spindle)
- *Euphorbia spp* (Spurge)
- *Fremontodendron californicum* (Flannel bush)
- *Hyacinthus spp*. (hyacinth)
  - Common garden and domestic flowering bulb, which as a dry bulb is very irritant particularly on tender skin, causing a painful rash
- *Laburnum spp.* (Golden chain)
- *Rhamnus cathartica* (Buckthorn)
- *Ricinus communis* (Castor oil plant)
- *Taxus baccata* (Yew)

Half-hardy and tender:

- *Brugmansia spp.* (Angels Trumpets)
- *Caladium spp.* (Angels Wings)
- *Capsicum annuum* (Chilli pepper)

- *Echium pininana* (Canary island bugloss)
- *Nerium oleander* (Oleander)
- *Opuntia spp.* (Prickly pear cactus)
- *Philodendron spp.* (Hearts entangled)
- *Primula obconica* (Primula)
- *Solanum pseudocapsicum* (Christmas cherry)

Topic 2.2

Native pests with severe impacts:

- *Aleyrodes prolatella* (Brassica whitefly)
- *Otiorhyncus sulcatus* (Vine weevil)
    - Adult weevils are nocturnal and wingless, causing notching of foliage of susceptible plants
    - Larvae in soil and growing media, feed on plant roots and cause poor growth and death in pot plants
- *Yponomeuta species* (Ermine moth)

Non-native and introduced pests with severe impacts:

- *Aculops fuchsia* (Fuchsia gall mite
- *Anoplophora species* (Longhorn beetles)
- *Bemisia tabaci* (Tobacco whitefly)
- *Cameraria ohridella* (Chestnut leaf miner)
- *Contarinia quinquenotata* (Hemerocallis gall midge)
- *Cydalima perspectalis* (Box tree caterpillar)
- *Dryocosmus kuriphilus* (Oriental chestnut gall wasp)
- *Frankliniella occidentalis* (Western Flower thrips)
- *Harmonia axyridis* (Harlequin Ladybird)
- *Lilioceris lilii* (Lily beetle)
- *Tetranychus urticae* (Two-spotted mite)

Topic 3.3

Native diseases with severe impacts:

- *Erwinia amylovora* (Fireblight)
- *Erysiphe spp.* (Powdery mildew)
- *Puccinia etc spp.* (Rust)
- *Plasmopara etc spp.* (Downy mildew)

Non-native and introduced diseases with severe impacts:

- *Apiognomonia veneta* (Anthracnose on plane)
- *Hymenoscyphus fraxineus* (Ash dieback (Ash Chalara dieback)
- *Ophiostoma ulmi* (Dutch elm disease)
- *Phytophthora ramorum* (P kernoviae)
- *Plasmopara impatiens* (Impatiens downy mildew)
    - A fungus-like water mould that causes yellowing of foliage, leaf loss and then death of affected plants, notably Impatiens sultani or busy lizzie.
- *Pseudomonas syringae aesculi* (Chestnut bleeding canker)

Learning outcome:

3. Know appropriate methods of prevention and control of problematic plants, pests and diseases and the importance of reporting and monitoring them

Topics

3.1 Suitable methods
3.2 Precautions to be taken
3.3 Reporting and record keeping
3.4 Monitoring

This learning outcome covers the means of preventing, mitigating the effects of or controlling the problems that have been identified and described in outcome two, recommending suitable safe practices at all times. The necessity of keeping auditable records and of ongoing monitoring to ensure that the controls have been effective are also within this outcome.

Topic 3.1

Learners need to describe suitable methods of control:

Prevention:

- Quarantine – incoming stock maintained in a separate area where contamination of the nursery and wider area can be minimized or eliminated; monitored for a specified period before release onto the nursery – useful means to reduce risk of introduction (Bemisia)
- Phytosanitary inspection – used with or without quarantine as a detailed health check of stock before movement on or off the nursery

Mitigation:

- Use of resistant cultivars as a means to minimize particular problems (soft fruit cultivars resistant to mildew, brassicas resistant to club-root, horse chestnut cultivars resistant to leaf miner)
- Biocides and disinfectants – used between one crop and the following to reduce or prevent the risk of a problem continuing, may take the form of sprays, heat treatment, chemical fumigation or drenches depending on the cropping situation (use of peroxyacetic acid as a clean-up spray on crop matting, steam sterilization of containers for re-use, or soil for soil-grown crops)

Controls:

- Cultural: crop rotation to minimize risk of problems building up or transferring from one crop to the next,
- Effective weed management by a 'see it, remove it' strategy of crop management, preventing weeds setting seed
- Weed-free nursery approach, where all staff are responsible for keeping areas clean
- Effective physical barriers to prevent weed seed entering sites, may include hedges and shelter-belts on field crops, or fleece-covered vents on protected crops
- Physical barriers on protected cropping nurseries including 'air-lock' doors to growing areas and fleece or mesh barriers on vents to prevent ingress of aphids and other pests from outside

- Biological controls: wide range of pest management solutions available particularly in protected cropping
- Pheromone traps to monitor and indicate timing and need for control of fruit pests (Codling moth on apples)
- Chemical sprays, fogs, fumigation, drenches, granules, controlled droplet application, injection as appropriate to situations
- Incineration: where appropriate to the problem, licenses may be required
- Transport off site: contaminated materials disposed of professionally by landfill or enclosed incineration by specialised contractors; transport secure against accidental release; movement license may be required
- Burial: for specified weeds burial in enclosed, lined landfill at specified depths may be a suitable means of disposal

Topic 3.2

Precautions to be taken:

- Handling potentially injurious plants and invasive weeds, pests and diseases must take into account the safety of the operative, the wider public including other colleagues and the safety of the wider environment including bio-diversity and wildlife. Consideration should include:
  - Use of PPE appropriate to the situation involved; for injurious plants this may include complete skin protection (Giant Hogweed); for control of certain pests full body protection including respirators may be required (Oak processionary moth). Codes of practice and COSHH / Risk Assessments to be adhered to for each specified control measure in place. Use of chemicals only allowed by qualified operatives or when directly supervised by a qualified operative
  - Licenses required for movement or disposal of certain specified problems

Topic 3.3

Reporting procedures that may apply:

- Pesticide application records – legislative requirement and providing traceability of what activities have taken place
- COSHH and Risk Assessments – ensuring that safe practices in terms of tasks, use and storage of hazardous materials etc., are being undertaken
- Product traceability – ensuring compliance with what is being grown, bought, sold, moved and disposed of throughout the life of all aspects of the products (including waste products and treatments)
- Waste transfer note – covering hazardous and non-hazardous wastes disposed of on or off-site
- Quality Assurance schemes – BOPP record keeping to maintain BOPP accreditation to cover all of the records listed in this section
- Lines of communication – what aspects should be reported: before actions are taken, after actions have been taken; who needs to be informed within the organisation (line managers, supervisors) and outside the organisation (statutory and non-statutory bodies). This will have a particular relevance to new and unknown problems (weeds and invasive / injurious plants, pests, diseases) with which the learner is unfamiliar.

Topic 3.4

The requirements for further monitoring of the following situations:

- Recurrence of pests and diseases following treatments
- Recurrence of weed and invasive plants after controls have been applied

- Appropriate frequencies of monitoring in different situations

Guidance for delivery

Unit content is expected to be delivered in a largely practical way to ensure learner engagement; wherever possible there should be a clear link to a work or work-equivalent situation.

Identification of invasive and injurious plants and weeds, pests and diseases will be by use of high-quality images in most cases, but where the opportunity arises for use of real (live or 'herbarium' etc) materials are available these should be used.

Employer engagement

Employer engagement is essential in order to maximise the value of learners' experience. A partnership approach should be adopted where possible with employers with whom the consortium has links, and with employers used for work experience placements.

It would be helpful for teachers to develop a method of maintaining contact with a range of employers in the sectors may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content, up to date.

Suggested learning resources

Websites

Department of Environment, Food and Rural Affairs (Defra)	https://secure.fera.defra.gov.uk/phiw/riskRegister
The Woodland Trust	www.woodlandtrust.org.uk/
Non Native Species Secretariat	www.nonnativespecies.org
The National Archives	www.legislation.gov.uk
Law and Your Environment	www.environmentlaw.org.uk
Health and Safety Executive	www.hse.gov.uk
Forest Research	www.forestry.gov.uk
Environment Agency	www.gov.uk/government/organisations/environment-agency
Horticulture Week on-line edition	www.hortweek.com

Appendix 1 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on **www.cityandguilds.com**.

City & Guilds Centre Manual
This document provides guidance for organisations wishing to become City & Guilds approved centres, as well as information for approved centres delivering City & Guilds qualifications. It covers the centre and qualification approval process as well as providing guidance on delivery, assessment and quality assurance for approved centres.

It also details the City & Guilds requirements for ongoing centre and qualification approval, and provides examples of best practice for centres. Specifically, the document includes sections on:

- the centre and qualification approval process
- assessment, internal quality assurance and examination roles at the centre
- registration and certification of candidates
- non-compliance and malpractice
- complaints and appeals
- equal opportunities
- data protection
- management systems
- maintaining records
- internal quality assurance
- external quality assurance.

Our Quality Assurance Requirements
This document explains the requirements for the delivery, assessment and awarding of our qualifications. All centres working with City & Guilds must adopt and implement these requirements across all of their qualification provision. Specifically, this document:

- specifies the quality assurance and control requirements that apply to all centres
- sets out the basis for securing high standards, for all our qualifications and/or assessments
- details the impact on centres of non-compliance

Our Quality Assurance Requirements document encompasses the relevant regulatory requirements of the following documents, which apply to all UK centres working with City & Guilds:

- Ofqual's General Conditions of Recognition

The **centre homepage** section of the City & Guilds website also contains useful information on

- **Walled Garden**: how to register and certificate candidates on line
- **Events**: dates and information on the latest Centre events
- **Online assessment**: how to register for e-assessments.

Useful contacts

UK learners General qualification information	**E: learnersupport@cityandguilds.com**
International learners General qualification information	**E: intcg@cityandguilds.com**
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	**E: information@cityandguilds.com**
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	**E: singlesubjects@cityandguilds.com**
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	**E: intops@cityandguilds.com**
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	**E: walledgarden@cityandguilds.com**
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 **E: business@cityandguilds.com**

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: **feedbackandcomplaints@cityandguilds.com**

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa), and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Licence to Practice (land-based qualifications) and Learning Assistant (an online e-portfolio).

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City & Guilds
1 Giltspur Street
London EC1A 9DD
www.cityandguilds.com