Level 3 Certificate, Subsidiary Diploma, 90-Credit Diploma, Diploma, Extended Diploma in Forestry and Arboriculture (0077-03)

www.cityandguilds.com
August 2017
Version 2.1

Qualification handbook for centres
500/8719/8
500/8724/1
600/5946/1
500/8564/5
500/8720/4

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. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. 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 Land Based Services (land-based qualifications), the Centre for Skills Development (CSD works to improve the policy and practice of vocational education and training worldwide) and Learning Assistant (an online e-portfolio).

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Level 3 Certificate, Subsidiary Diploma, 90-Credit Diploma, Diploma, Extended Diploma in Forestry and Arboriculture (0077-03)

www.cityandguilds.com
August 2017
Version 2.11

Qualification title	Number	QAN
Level 3 Certificate in Forestry and Arboriculture	0077-03	500/8719/8
Level 3 Subsidiary Diploma in Forestry and Arboriculture	0077-03	500/8724/1
Level 3 90-Credit Diploma in Forestry and Arboriculture	0077-03	600/5946/1
Level 3 Diploma in Forestry and Arboriculture	0077-03	500/8564/5
Level 3 Extended Diploma in Forestry and Arboriculture	0077-03	500/8720/4

Version and date	Change detail	Section
V2.1 August 2017	• Added TQT and GLH details. • Removed QCF	• Introduction • Summary of units and Appendix 2

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Contents

1 Introduction to the qualifications

Qualification title and level	GLH	TQT	City & Guilds qualification number	Qualification accreditation number
Level 3 Certificate in Forestry and Arboriculture	180	300	0077-03	500/8719/8
Level 3 Subsidiary Diploma in Forestry and Arboriculture	360	600	0077-03	500/8724/1
Level 3 90-Credit Diploma in Forestry and Arboriculture	540	900	0077-03	600/5946/1
Level 3 Diploma in Forestry and Arboriculture	720	1200	0077-03	500/8564/5
Level 3 Extended Diploma in Forestry and Arboriculture	1080	1800	0077-03	500/8720/4

Qualification summary

Qualification title and level	Credits	Guided Learning Hours (GLH)
Level 3 Certificate in Forestry and Arboriculture	30	180
Level 3 Subsidiary Diploma in Forestry and Arboriculture	60	360
Level 3 90-Credit Diploma in Forestry and Arboriculture	90	540
Level 3 Diploma in Forestry and Arboriculture	120	720
Level 3 Extended Diploma in Forestry and Arboriculture	180	1080

These qualifications meet the needs of learners in a centre-based environment who may wish to work within the forestry or arboriculture industry or progress to further learning and/or training. These qualifications allow learners to develop underpinning knowledge whilst practising skills that could be used within employment in the forestry or arboriculture industry. These qualifications replace the Level 3 Advanced National Certificate in Horticulture (Arboriculture) (0345-31) and the Level 3 Advanced National Diploma in Horticulture (Arboriculture) (0345-37) which expired on 31 July 2010 (QAN 500/4341/9 and 500/4342).

These qualifications were developed in association with Lantra SSC, Landex and the industry.

Specialist Learning (SL)

Specialist Learning (SL) offers young people the opportunity to study a particular topic in more depth or broaden their studies through complementary learning. The Level 3 Certificate and Subsidiary Diploma in Forestry and Arboriculture have been approved as SL by the Environmental and Land-based Diploma DDP and Ofqual for the Advanced Diploma in Environmental and Land-based Studies. They have been designed to:

- complement principal learning within the Advanced Diploma in Environmental and Land-based studies
- provide a broad background understanding of the Forestry and Arboriculture sector and an introduction to the practical skills and knowledge required
- provide an awareness of the range of jobs and work settings in the Forestry and Arboricultural sector
- enable learners to make an informed assessment of their own aptitude for work in this sector and to make informed decisions about careers
- encourage learners to reach a level of knowledge and skills that will facilitate progress into further vocational learning or to potential employment in the sector
- introduce learners to the discipline of the working environment and to encourage mature attitudes to the community in general
- encourage learners to value continued learning and remain in the learning process
- allow learners to learn, develop and practise selected skills required for progression in the sector
- provide opportunities for progression to the Advanced Diploma in Environmental and Land-based and other related qualifications in the sector.

1.1 Qualification structure

Level 3 Certificate

To achieve the **Level 3 Certificate in Forestry and Arboriculture**, learners are required to achieve 30 credits from any combination of the units.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Excluded combination of units (if any)
Optional group				
A6011379	305	Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture	10	
R6011405	306	Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection for Forestry and Arboriculture	10	
A6009843	308	Undertake Advanced Arboricultural Practices	10	
L6010107	309	Understanding Woodland Management	10	
L6011810	310	Understand and Carry Out Forest and Woodland Skills	10	
D6011813	311	Measure Trees and Carry Out Woodland Sampling	10	
K6009921	312	Understand the Principles and Identify the Signs of Pests and Diseases of Trees	10	
F6009911	313	Undertake Tree and Shrub Pruning and Maintenance	10	
T6010408	314	Undertake Tree Surveys and Inspections and Analyse the Data	10	
K6009837	327	Understand the Principles of Tree Felling and Chainsaw Use	10	

Level 3 Subsidiary Diploma

To achieve the **Level 3 Subsidiary Diploma in Forestry and Arboriculture**, learners must achieve 60 credits from any of the units within the Optional group.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Excluded combination of units (if any)
Optional group				
L6009149	303	Understand the Principles of Plant Science	5	
T6009579	304	Understand the Principles of Soil Science	5	
A6011379	305	Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture	10	
R6011405	306	Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection for Forestry and Arboriculture	10	
H6009805	307	Undertaking Land-based Machinery Operations	10	
A6009843	308	Undertake Advanced Arboricultural Practices	10	
L6010107	309	Understanding Woodland Management	10	
L6011810	310	Understand and Carry Out Forest and Woodland Skills	10	
D6011813	311	Measure Trees and Carry Out Woodland Sampling	10	
K6009921	312	Understand the Principles and Identify the Signs of Pests and Diseases of Trees	10	
F6009911	313	Undertake Tree and Shrub Pruning and Maintenance	10	

T6010408	314	Undertake Tree Surveys and Inspections and Analyse the Data	10	
L6010382	315	Understand the Legislation Relating to Trees in the UK	5	
F6009827	316	Understanding Principles of Forest Recreation	10	
A6011818	317	Understand the Principles of Silviculture	5	
M6010407	318	Understand the Principles of Tree Science	10	
H6010372	319	Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery	10	
A6010376	320	Maintain and Understand Equipment used for Timber Conversion and Utilisation	10	
A6010409	321	Understand and Plan Urban and Community Forestry Projects	10	
M6009841	322	Manage Heritage Gardens and Arboreta	10	
M6009709	324	Business Management in the Land-based Sector	10	
K6009837	327	Understand the Principles of Tree Felling and Chainsaw Use	10	
H6009643	328	Understanding Principles of Land-based Machinery	10	

Level 3 90-Credit Diploma

To achieve the **Level 3 90-Credit Diploma in Forestry and Arboriculture**, learners must achieve 90 credits from any of the units within the Optional group.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Excluded combination of units (if any)
Optional group				
R6009394	301	Undertake and Review Work Related Experience in the Land-based Industries	10	
M6010021	302	Undertake an Investigative Project in the Land-based Sector	10	
L6009149	303	Understand the Principles of Plant Science	5	
T6009579	304	Understand the Principles of Soil Science	5	
A6011379	305	Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture	10	
R6011405	306	Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection for Forestry and Arboriculture	10	
H6009805	307	Undertaking Land-based Machinery Operations	10	
A6009843	308	Undertake Advanced Arboricultural Practices	10	
L6010107	309	Understanding Woodland Management	10	
L6011810	310	Understand and Carry Out Forest and Woodland Skills	10	
D6011813	311	Measure Trees and Carry Out Woodland Sampling	10	
K6009921	312	Understand the Principles and Identify the Signs of Pests and Diseases of Trees	10	

F6009911	313	Undertake Tree and Shrub Pruning and Maintenance	10	
T6010408	314	Undertake Tree Surveys and Inspections and Analyse the Data	10	
L6010382	315	Understand the Legislation Relating to Trees in the UK	5	
F6009827	316	Understanding Principles of Forest Recreation	10	
A6011818	317	Understand the Principles of Silviculture	5	
M6010407	318	Understand the Principles of Tree Science	10	
H6010372	319	Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery	10	
A6010376	320	Maintain and Understand Equipment used for Timber Conversion and Utilisation	10	
A6010409	321	Understand and Plan Urban and Community Forestry Projects	10	
M6009841	322	Manage Heritage Gardens and Arboreta	10	
M6009709	324	Business Management in the Land-based Sector	10	
K6009837	327	Understand the Principles of Tree Felling and Chainsaw Use	10	
H6009643	328	Understanding Principles of Land-based Machinery	10	

Level 3 Diploma

To achieve the **Level 3 Diploma in Forestry and Arboriculture** learners are required to achieve 120 credits of which 30 must be from units in the Mandatory group 1, 10 credits from the units in Mandatory group 2 and a further 80 credits from any of the units within the Optional group.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Excluded combination of units (if any)
Mandatory group 1				
R6009394	301	Undertake and Review Work Related Experience in the Land-based Industries	10	
M6010021	302	Undertake an Investigative Project in the Land-based Sector	10	
L6009149	303	Understand the Principles of Plant Science	5	
T6009579	304	Understand the Principles of Soil Science	5	
Mandatory group 2				
A6011379	305	Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture	10	
R6011405	306	Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection for Forestry and Arboriculture	10	
Optional group				
H6009805	307	Undertaking Land-based Machinery Operations	10	
A6009843	308	Undertake Advanced Arboricultural Practices	10	
L6010107	309	Understanding Woodland Management	10	
L6011810	310	Understand and Carry Out Forest and Woodland Skills	10	

D6011813	311	Measure Trees and Carry Out Woodland Sampling	10	
K6009921	312	Understand the Principles and Identify the Signs of Pests and Diseases of Trees	10	
F6009911	313	Undertake Tree and Shrub Pruning and Maintenance	10	
T6010408	314	Undertake Tree Surveys and Inspections and Analyse the Data	10	
L6010382	315	Understand the Legislation Relating to Trees in the UK	5	
F6009827	316	Understanding Principles of Forest Recreation	10	
A6011818	317	Understand the Principles of Silviculture	5	
M6010407	318	Understand the Principles of Tree Science	10	
H6010372	319	Operate Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery	10	
A6010376	320	Maintain and Understand Equipment Used for Timber Conversion and Utilisation	10	
A6010409	321	Understand and Plan Urban and Community Forestry Projects	10	
M6009841	322	Manage Heritage Gardens and Arboreta	10	
Y6009204	323	Undertaking Woodland Habitat Management	10	
M6009709	324	Business Management in the Land-based Sector	10	

Y6009610	325	Undertake Estate Skills	10	
J6011823	326	Undertake Arboricultural Skills	10	
K6009837	327	Understand the Principles of Tree Felling and Chainsaw Use	10	
H6009643	328	Understanding Principles of Land-based Machinery	10	

Level 3 Extended Diploma

To achieve the **Level 3 Extended Diploma in Forestry and Arboriculture**, learners are required to achieve 180 credits, of which 50 must be from the mandatory group and the remaining credits from the optional group.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Excluded combination of units (if any)
Mandatory Group				
R6009394	301	Undertake and Review Work Related Experience in the Land-based Industries	10	
M6010021	302	Undertake an Investigative Project in the Land-based Sector	10	
L6009149	303	Understand the Principles of Plant Science	5	
T6009579	304	Understand the Principles of Soil Science	5	
A6011379	305	Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture	10	
R6011405	306	Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection for Forestry and Arboriculture	10	
Optional group				
H6009805	307	Undertaking Land-based Machinery Operations	10	
A6009843	308	Undertake Advanced Arboricultural Practices	10	
L6010107	309	Understanding Woodland Management	10	
L6011810	310	Understand and Carry Out Forest and Woodland Skills	10	

D6011813	311	Measure Trees and Carry Out Woodland Sampling	10	
K6009921	312	Understand the Principles and Identify the Signs of Pests and Diseases of Trees	10	
F6009911	313	Undertake Tree and Shrub Pruning and Maintenance	10	
T6010408	314	Undertake Tree Surveys and Inspections and Analyse the Data	10	
L6010382	315	Understand the Legislation Relating to Trees in the UK	5	
F6009827	316	Understanding Principles of Forest Recreation	10	
A6011818	317	Understand the Principles of Silviculture	5	
M6010407	318	Understand the Principles of Tree Science	10	
H6010372	319	Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery	10	
A6010376	320	Maintain and Understand Equipment Used for Timber Conversion and Utilisation	10	
A6010409	321	Understand and Plan Urban and Community Forestry Projects	10	
M6009841	322	Manage Heritage Gardens and Arboreta	10	
Y6009204	323	Undertaking Woodland Habitat Management	10	
M6009709	324	Business Management in the Land-based Sector	10	

Y6009610	325	Undertake Estate Skills	10	
J6011823	326	Undertake Arboricultural Skills	10	
K6009837	327	Understand the Principles of Tree Felling and Chainsaw Use	10	
H6009643	328	Understanding the Principles of Land-based Machinery	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	GLH	TQT
City & Guilds Level 3 90-Credit Diploma in Forestry and Arboriculture	540	900
City & Guilds Level 3 Certificate in Forestry and Arboriculture	180	300
City & Guilds Level 3 Extended Diploma in Forestry and Arboriculture	1080	1800
City & Guilds Level 3 Subsidiary Diploma in Forestry and Arboriculture	360	600
City & Guilds Level 3 Diploma in Forestry and Arboriculture	720	1200

1.2 Opportunities for progression

On completion of these qualifications learners may progress into employment or to the following City & Guilds qualifications:

- Level 4 and above centre-based qualifications in Forestry and Arboriculture eg. Foundation Degree, Higher National Diploma
- Level 3 or 4 qualifications in Work-based Forestry and Arboriculture
- Other related qualifications

1.3 Qualification support materials

City & Guilds also provides the following publications and resources specifically for these qualifications:

Description	How to access
Assignment guide	www.cityandguilds.com
Marking guide	information@cityandguilds.com
Information sheets	www.cityandguilds.com
fast track approval forms/generic fast track approval form	www.cityandguilds.com

2 Centre requirements

This section outlines the approval processes for Centres to offer these qualifications and any resources that Centres will need in place to offer the qualifications including qualification-specific requirements for Centre staff.

Centres already offering the Level 3 Advanced National Certificate in Horticulture (Arboriculture) (0345-31) (QAN 500/4341/9) and/or Level 3 Advanced National Diploma in Horticulture (Arboriculture) (0345-37) (QAN 500/4342/0)

Centres approved to offer the Level 3 Advanced National Certificate in Horticulture (Arboriculture) (0345-31) and/or Level 3 Advanced National Diploma in Horticulture (Arboriculture) (0345-37) may apply for approval for the new Level 3 Certificate, Subsidiary Diploma, Diploma and Extended Diploma in Forestry and Arboriculture using the **fast track approval form**, available from the City & Guilds website. Centres may apply to offer the new qualifications using the fast track form

- providing there have been no changes to the way the qualifications are delivered, and
- if they meet all of the approval criteria specified in the fast track form guidance notes.

Fast track approval is available for 12 months from the launch of the qualification. After this time, the qualification is subject to the **standard** Qualification Approval Process. It is the centre's responsibility to check that fast track approval is still current at the time of application.

New centres must apply for centre and qualification approval. Further information on this process is available on the City & guilds website.

Existing City & Guilds /City & Guilds centres that do not offer Level 3 Advanced National Certificate/Diploma in Forestry and Arboriculture (0345-31/0345-37) will need to get specific qualification approval to run these qualifications (contact your City & Guilds Local Office).

2.1 Resource requirements

Human resources

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be technically competent in the areas for which they are delivering training and/or have experience of providing training. This knowledge must be at least to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- be occupationally knowledgeable in the areas of forestry or arboriculture for which they are delivering training. This knowledge must be at least to the same level as the training being delivered
- have credible experience of providing training.

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but must never internally verify their own assessments.

Assessors and internal verifiers

The centre must provide Assessor personnel who must be occupationally competent in the industry either qualified to at least level 3 and/or have current experience of working in the industry at this level.

The centre must provide Internal Quality Assurance personnel who must be occupationally competent in the land-based sector either qualified to at least level 3 and/or have current experience of working in the industry at this level.

Assessors/Internal Quality Assurance personnel may hold relevant qualifications such as D32/33/34 or A1/V1 or TAQA however they are not a mandatory requirement for this qualification. They should have had formal training in assessment/IQA, which may be the qualifications above, or other training that allows the assessor to demonstrate competence in the practice of assessment/IQA. This training may be carried out in-house or with an external agency.

TAQA qualifications are considered very appropriate as Continuing Professional Development (CPD) or as best practice standards for new centre staff to work towards.

Continuing professional development (CPD)

Centres are expected to support their staff in ensuring that their knowledge remains current of the occupational area and of best practice in delivery, mentoring, training, assessment and verification, and that it takes account of any national or legislative developments.

2.2 Learner entry requirements

There are no formal entry requirements for learners undertaking these qualifications. However, centres must ensure that learners have the potential and opportunity to gain the qualifications successfully.

As part of the assessment for the Level 3 Diploma qualifications that contain work experience as a mandatory unit, learners must have access to a work setting/placement.

Age restrictions

These qualifications have been approved/accredited for 16-18, 18+ and 19+ learners. However, there are no age limits attached to learners undertaking the qualification unless this is a legal requirement of the process or the environment.

3 Course design and delivery

3.1 Initial assessment and induction

Centres will need to make an initial assessment of each learner prior to the start of their programme to ensure they are entered for an appropriate type and level of qualification.

The initial assessment should identify:

- any specific training needs the learner has, and the support and guidance they may require when working towards their qualifications. This is sometimes referred to as diagnostic testing.
- any units the learner has already completed, or credit they have accumulated which is relevant to the qualifications they are about to begin.

City & Guilds recommends that centres provide an induction programme to ensure the learner fully understands the requirements of the qualifications they will work towards, their responsibilities as a learner, and the responsibilities of the centre. It may be helpful to record the information on a learning contract.

3.2 Recommended delivery strategies

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualifications before designing a course programme.

Centres may design course programmes of study in any way which:

- best meets the needs and capabilities of their learners
- satisfies the requirements of the qualifications.

When designing and delivering the course programme, centres might wish to incorporate other teaching and learning that is not assessed as part of the qualifications. This might include the following:

- Functional skills
- Personal learning and thinking skills (PLTS)

Where applicable, this could involve enabling the learner to access relevant qualifications covering these skills.

4 Assessment

4.1 Summary of assessment methods

For these qualifications, learners will be required to complete the following assessments:

- **one** assignment for **each** unit

City & Guilds provides the following assessments:

- Assignment guide containing assignments for each unit

Time constraints

The following time constraints must be applied to the assessment of these qualifications:

- All assignments must be completed and assessed within the learner's period of registration. Centres should advise learners of any internal timescales for the completion and marking of individual assignments.

4.2 Assignments

The assignment guide for these qualifications is available to download from **www.cityandguilds.com**.

4.3 Recognition of prior learning (RPL)

Recognition of Prior Learning (RPL) recognises the contribution a person's previous experience could contribute to a qualification. RPL is allowed and is also sector specific.

4.4 Resubmission of Assignments

Centres are advised to adopt the following policy on the re-submission of work:

Learners who fail an assignment on the formal (summative) submission, or who would like the opportunity to improve their grade, may re-submit once only and may then achieve either a Pass, Merit or Distinction as appropriate. An appropriate time period between formal submission and re-submission should be set by the centre. Multiple re-submissions are not permitted. Learners who fail to hand in work on the formal submission date, where there is no legitimate reason, should be capped to a maximum of a Pass grade only at the re-submission stage. It is at the discretion of the centre to set informal (formative) submission dates, if appropriate, and a formal submission date.

5 Units

Summary of units

City & Guilds unit number	Title	Unit numbers	Credits
301	Undertake and Review Work Related Experience in the Land-based Industries	R6009394	10
302	Undertake an Investigative Project in the Land-based Sector	M6010021	10
303	Understand the Principles of Plant Science	L6009149	5
304	Understand the Principles of Soil Science	T6009579	5
305	Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture	A6011379	10
306	Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection for Forestry and Arboriculture	R6011405	10
307	Undertaking Land-based Machinery Operations	H6009805	10
308	Undertake Advanced Arboricultural Practices	A6009843	10
309	Understanding Woodland Management	L6010107	10
310	Understand and Carry Out Forest and Woodland Skills	L6011810	10
311	Measure Trees and Carry Out Woodland Sampling	D6011813	10
312	Understand the Principles and Identify the Signs of Pests and Diseases of Trees	K6009921	10
313	Undertake Tree and Shrub Pruning and Maintenance	F6009911	10
314	Undertake Tree Surveys and Inspections and Analyse the Data	T6010408	10
315	Understand the Legislation Relating to Trees in the UK	L6010382	5
316	Understanding Principles of Forest Recreation	F6009827	10
317	Understand the Principles of Silviculture	A6011818	5
318	Understand the Principles of Tree Science	M6010407	10
319	Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery	H6010372	10
320	Maintain and Understand Equipment Used for Timber Conversion and Utilisation	A6010376	10
321	Understand and Plan Urban and Community Forestry Projects	A6010409	10
322	Manage Heritage Gardens and Arboreta	M6009841	10

323	Undertaking Woodland Habitat Management	Y6009204	10
324	Business Management in the Land-based Sector	M6009709	10
325	Undertake Estate Skills	Y6009610	10
326	Undertake Arboricultural Skills	J6011823	10

327	Understanding the Principles of Tree Felling and Chainsaw Use	K6009837	10
328	Understanding the Principles of Land-based Machinery	H6009643	10

Certification/grading modules

City & Guilds unit number	Title
910	Certification module for Level 3 Certificate in Forestry and Arboriculture - pass grade
911	Certification module for Level 3 Certificate in Forestry and Arboriculture - merit grade
912	Certification module for Level 3 Certificate in Forestry and Arboriculture - distinction grade
913	Certification module for Level 3 Subsidiary Diploma in Forestry and Arboriculture - pass grade
914	Certification module for Level 3 Subsidiary Diploma in Forestry and Arboriculture - merit grade
915	Certification module for Level 3 Subsidiary Diploma in Forestry and Arboriculture - distinction grade
916	Certification module for Level 3 Diploma in Forestry and Arboriculture - pass grade
917	Certification module for Level 3 Diploma in Forestry and Arboriculture - merit grade
918	Certification module for Level 3 Diploma in Forestry and Arboriculture - distinction grade
919	Certification module for Level 3 Extended Diploma in Forestry and Arboriculture - pass grade
920	Certification module for Level 3 Extended Diploma in Forestry and Arboriculture - merit grade
921	Certification module for Level 3 Extended Diploma in Forestry and Arboriculture - distinction grade
925	Certification module for Level 3 Certificate in Forestry and Arboriculture – distinction* grade
926	Certification module for Level 3 Subsidiary Diploma in Forestry and Arboriculture –distinction* grade
927	Certification module for Level 3 Diploma in Forestry and Arboriculture – distinction* grade
928	Certification module for Level 3 Extended Diploma in Forestry and Arboriculture – distinction* grade
932	Certification module for Level 3 90-Credit Diploma in Forestry and Arboriculture – pass grade
933	Certification module for Level 3 90-Credit Diploma in Forestry and Arboriculture – merit grade
934	Certification module for Level 3 90-Credit Diploma in Forestry and

	Arboriculture – distinction grade
935	Certification module for Level 3 90-Credit Diploma in Forestry and Arboriculture – distinction* grade

6 Registration and Certification

The Level 3 Certificate, Subsidiary Diploma, 90-Credit Diploma, Diploma and Extended Diploma in Forestry and Arboriculture qualifications have been grouped into one programme for registration.

Tutors and Examination Officers should ensure that learners are registered onto 0077-03 and that all 0077-03 documentation for teaching and administration with City & Guilds is used.

When learners' results are submitted to City & Guilds, centres should also submit the relevant Certificate, Subsidiary Diploma, Diploma and Extended Diploma certification/grading component, according to which units the learner has achieved, so that the appropriate certificate is generated. The overall grade can be calculated using the formula in the assignment guide.

Please note: There are four certification/grading modules for each of the qualifications which differentiates the four grades – pass, merit, distinction and distinction*. Once the overall grade for the assignments has been calculated, the correct certification/grading module needs to be indicated on the results entry.

For example, if a learner achieves the Level 3 Certificate in Forestry and Arboriculture at an overall merit grade, then the certification module 911 needs to be submitted. Please see the Rules of Combination below or the City & Guilds catalogue.

Level 3 Certificate in Forestry and Arboriculture QAN 500/8719/8	
Rules for achievement of qualification	30 credits from (305 – 306), (308 – 314), 327 Plus 910 for certification at pass grade

Level 3 Certificate in Forestry and Arboriculture QAN 500/8719/8	
Rules for achievement of qualification	30 credits from (305 – 306), (308 – 314), 327 Plus 911 for certification at merit grade

Level 3 Certificate in Forestry and Arboriculture QAN 500/8719/8	
Rules for achievement of qualification	30 credits from (305 – 306), (308 – 314), 327 Plus 912 for certification at distinction grade

Level 3 Certificate in Forestry and Arboriculture QAN 500/8719/8	
Rules for achievement of qualification	30 credits from (305 – 306), (308 – 314), 327 Plus 925 for certification at distinction* grade

Level 3 Subsidiary Diploma in Forestry and Arboriculture QAN 500/8724/1	
Rules for achievement of qualification	60 credits from (303 – 322), 324, (327 – 328) Plus 913 for certification at pass grade

Level 3 Subsidiary Diploma in Forestry and Arboriculture QAN 500/8724/1	
Rules for achievement of qualification	60 credits from (303 – 322), 324, (327 – 328) Plus 914 for certification at merit grade

Level 3 Subsidiary Diploma in Forestry and Arboriculture QAN 500/8724/1	
Rules for achievement of qualification	60 credits from (303 – 322), 324, (327 – 328) Plus 915 for certification at distinction grade

Level 3 Subsidiary Diploma in Forestry and Arboriculture QAN 500/8724/1	
Rules for achievement of qualification	60 credits from (303 – 322), 324, (327 – 328) Plus 926 for certification at distinction* grade

Level 3 90-Credit Diploma in Forestry and Arboriculture QAN 600/5946/1	
Rules for achievement of qualification	90 credits from (301 – 322), 324, (327 – 328) Plus 932 for certification at pass grade

Level 3 90-Credit Diploma in Forestry and Arboriculture QAN 600/5946/1	
Rules for achievement of qualification	90 credits from (301 – 322), 324, (327 – 328) Plus 933 for certification at merit grade

Level 3 90-Credit Diploma in Forestry and Arboriculture QAN 600/5946/1	
Rules for achievement of qualification	90 credits from (301 – 322), 324, (327 – 328) Plus 934 for certification at distinction grade

Level 3 90-Credit Diploma in Forestry and Arboriculture QAN 600/5946/1	
Rules for achievement of qualification	90 credits from (301 – 322), 324, (327 – 328) Plus 935 for certification at distinction* grade

Level 3 Diploma in Forestry and Arboriculture QAN 500/8564/5	
Rules for achievement of qualification	30 credits from (301 – 304), 10 credits from 305 or 306, plus a minimum of 80 credits from (307 –328) Plus 916 for certification at pass grade

Level 3 Diploma in Forestry and Arboriculture QAN 500/8564/5	
Rules for achievement of qualification	30 credits from (301 – 304), 10 credits from 305 or 306, plus a minimum of 80 credits from (307 –328) Plus 917 for certification at merit grade

Level 3 Diploma in Forestry and Arboriculture QAN 500/8564/5	
Rules for achievement of qualification	30 credits from (301 – 304), 10 credits from 305 or 306, plus a minimum of 80 credits from (307 –328) Plus 918 for certification at distinction grade

Level 3 Diploma in Forestry and Arboriculture QAN 500/8564/5	
Rules for achievement of qualification	30 credits from (301 – 304), 10 credits from 305 or 306, plus a minimum of 80 credits from (307 –328) Plus 927 for certification at distinction grade

Level 3 Extended Diploma in Forestry and Arboriculture QAN 500/8720/4	
Rules for achievement of qualification	50 credits from (301 – 306) plus a minimum of 130 credits from (307 –328) Plus 919 for certification at pass grade

Level 3 Extended Diploma in Forestry and Arboriculture QAN 500/8720/4

Rules for achievement of qualification	50 credits from (301 – 306) plus a minimum of 130 credits from (307 –328) Plus 920 for certification at merit grade

Level 3 Extended Diploma in Forestry and Arboriculture QAN 500/8720/4	
Rules for achievement of qualification	50 credits from (301 – 306) plus a minimum of 130 credits from (307 –328) Plus 921 for certification at distinction grade

Level 3 Extended Diploma in Forestry and Arboriculture QAN 500/8720/4	
Rules for achievement of qualification	50 credits from (301 – 306) plus a minimum of 130 credits from (307 –328) Plus 928 for certification at distinction grade

- Learners must be registered at the beginning of their course. Centres should submit registrations using Walled Garden or Form S (Registration), under scheme/complex 0077-03.

- When assignments have been successfully completed results should be submitted on Walled Garden or Form S (Results submission). One of the certification/grading modules 910 to 921 or 925 to 928 or 932 to 935 need to be submitted to generate the appropriate certificate and grade. Centres should note that results will not be processed by City & Guilds until verification records are complete

- Learners achieving one or more assessment components will receive a Certificate of Unit Credit listing the assessment components achieved. Learners achieving the number and combination of assessment components required to meet a defined Rule of Combination will, in addition, be issued with a certificate. Centres must submit a certification/grading component to allow this to happen.

Full details on the procedures for all City & Guilds qualifications registered and certificated through City & Guilds can be found on the City & Guilds on-line catalogue.

Unit 301 Undertake and Review Work Related Experience in the Land-based Industries

Level: 3

Credit value: 10

Unit aim:

The aim of this unit is to give learners the skills needed to identify, participate in and review work experience in the environmental and land-based sector. The unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand the opportunities in the environmental and land-based industries
2. Be able to prepare for a work-based experience in the environmental and land-based industry
3. Be able to undertake a work-based experience in the environmental and land-based industry
4. Be able to review a work-based experience in the environmental and land-based sector

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

n/a.

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge

Unit 301 Undertake and Review Work Related Experience in the Land-based Industries

Outcome 1 Understand the opportunities in the environmental and land-based industries

Assessment Criteria

The learner can:

1. Evaluate **career and progression opportunities** within an environmental and land-based industry

Unit content

Career and progression opportunities

Job roles relevant to the sector: managerial, supervisory, team worker, trainee, volunteer, common job titles within the relevant sector, main duties and responsibilities

Skills needed to fulfil duties and responsibilities of appropriate jobs: job specific, vocational and personal

Progression pathways from trainee or team worker positions to supervisory and management posts. Skills, qualifications and experience required to achieve career progression

Evaluate career and progression opportunities: advantages and disadvantages of identified pathways, suitability to personal interests, skills and qualifications, role of work experience in preparing for a selected career

Unit 301 Undertake and Review Work Related Experience in the Land-based Industries

Outcome 2 Be able to prepare for a work-based experience in the environmental and land-based industry

Assessment Criteria

The learner can:

1. **Select** an appropriate work-based experience and complete the **application process**
2. Demonstrate **interview skills** as an interviewee
3. Prepare for a work-based experience, identifying **targets, aims and objectives**

Unit content

Select

Suitable work experience position based on existing skills, experience, qualifications, development of skills and experience to achieve future employment goals

Application process

Finding suitable job opportunities from e.g. trade magazines, websites, employer approaches to the centre, completion of an application form, curriculum vitae and letter of application

Interview skills

Interview preparation: Research the business and job role, suitable dress and personal presentation, information to find out and suitable questions to ask. Interview performance: attend punctually and dressed appropriately, answering questions, completion of other tests (e.g. practical, aptitude), and reflection on interview performance

Targets, aims and objectives

Aims: overall impact of work experience on skills, experience, future employability, targets / objectives, specific development of workplace skills and knowledge (e.g. technical, vocational, business, team working, communication and employability)

Unit 301 Undertake and Review Work Related Experience in the Land-based Industries

Outcome 3 Be able to undertake a work-based experience in the environmental and land-based industry

Assessment Criteria

The learner can:

1. **Undertake** a selected appropriate work-based experience
2. Maintain a **record of activities and achievements** during a work-based experience.

Unit content

Undertake

Completion of 300 hours of appropriate work experience, attend punctually and reliably, work competently and in line with job role requirements, health and safety, security, confidentiality, effective working relationships with colleagues, supervisors and customers.

Record of activities and achievements

Job description for work role, main duties and responsibilities, regular daily working routine, diary of additional tasks, duties, learning experiences portfolio of work experience (e.g. photographs, witness statements, work experience provider's or assessor's reports, progress reviews)

Unit 301 Undertake and Review Work Related Experience in the Land-based Industries

Outcome 4 Be able to review a work- based experience in the environmental and land-based sector

Assessment Criteria

The learner can:

1. **Present evidence** of activities and achievements during a work-based experience
2. **Review** a work-based experience, identifying strengths and areas for improvement

Unit content

Present evidence

Name of work experience provider, nature of the organisation (type of business, products or services, customers), organisation structure chart, job description for work role, main duties and responsibilities, regular daily working routine, health, safety and welfare of employees, customers, animals, diary of additional tasks, duties, learning experiences, portfolio of work experience (e.g. photographs, witness statements, work experience provider's or assessor's reports and progress reviews)

Review

Business effectiveness: products and services, physical resources (e.g. buildings, machinery, equipment), business procedures, staff management and supervision, employees' skills and development, marketing and customer relations, personal workplace effectiveness: work speed, work quality, punctuality, attendance, reliability, dress and personal presentation, working relationships with peers, working relationships with supervisor, work experience aims, objectives and targets, impact of work experience on future career ambitions

Unit 301 Undertake and Review Work Related Experience in the Land-based Industries

Notes for guidance

Learners on vocational courses should have experience of the type of work that they hope to do, and of the expectations of potential future employers. Many Level 3 learners are likely to have already had experience of working in the land-based and environmental industries, so this unit seeks to provide new experience opportunities for these learners.

Ideally this unit should be undertaken in a real business environment relevant to the subject interest of the learner, but actual work experience may be gained by a number of routes, e.g. as part of an industrial placement whilst within the programme, whilst working on a planned daily or weekly basis on the centre's commercial and/or educational facilities, whilst undertaking voluntary work within the industry, as previous relevant and current work experience in the industry or as a member of a group of learners invited to carry out practical work on a suitable business.

Throughout the unit, the emphasis should be on safe working. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working.

Learners should complete the equivalent of 8 weeks (or 300 hours) work experience to achieve this unit. If work experience is in the industry, centres should be mindful of their responsibilities for ensuring that work placements have appropriate supervision, insurance and health and safety policies in place.

In Outcome 1, learners will explore the different job roles and responsibilities, and the job titles commonly associated with them in their specialist sector. This background understanding is likely to require some formal classroom teaching, and may be closely linked to material in the unit "Business Management". Learners should be encouraged to explore the range of employment opportunities and career paths within their specialist sector. It would be appropriate for employers to be invited to outline to learners their expectations in the workplace. Learners will then consider the skills and qualifications that are required for appropriate jobs for themselves and should be encouraged to think about skills and qualifications that they may need to acquire to achieve their employment and careers ambitions. Evaluation of career and progression opportunities should include advantages and disadvantages of at least 3 possible career pathways within their specialist sector. This should help them to identify suitable work experience.

Outcome 2 involves learners going through the process of applying for work experience. They will need to locate suitable job adverts or work experience opportunities, but can be supported by centres suggesting suitable placements. When applying for work experience learners should produce, as a minimum, a detailed curriculum vitae and letter of application using a computer. Learners may need to be given supported workshop time on computers to develop these documents. Before attending for a work experience interview it would be appropriate for learners to role play an interview and be given feedback on their interview technique. After attending for an interview they should reflect on their performance and how they could improve their effectiveness. Before commencing work experience they should set overall aims to be achieved during the period and SMART (specific, measurable, achievable, realistic, timescaled) targets or objectives for learning and improvement in relation to future career aims.

Outcome 3 requires that learners effectively complete their period of work experience, meeting the requirements of the workplace appropriate for their position. It would be advisable for their progress to be reviewed at least once during the period and they should have access to tutor support in case of difficulties arising. During their work placement learners must produce the details of their job role and working routine, maintain a diary at least weekly and collate other relevant information on their work placement, performance and achievements. It would be appropriate for tutors to complete a report in consultation with the work experience provider mid-way and at the end of the placement.

In Outcome 4, learners will use evidence from outcome 3 to present a report, oral and/or written, on their work experience business, job role, learning and achievements. They will then review the effectiveness of the workplace, making realistic and justified suggestions for improvement. Review of their own workplace performance and achievements should include all of the content identified, with reference to relevant evidence, e.g. reports, progress reviews, and the extent to which their aims, objectives/targets have been achieved. Learners should consider further training and experience that will help them to achieve their career ambitions.

Unit 302 Undertake an Investigative Project in the Land-based Sector

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the principles of undertaking an investigative project and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will develop project knowledge and skills by investigating a chosen topic area through a project. They will explore topic areas that interest them and select one topic for their investigative project. They will plan and carry out their investigative project working to meet deadlines and monitoring performance. The learner will prepare an evaluative report looking at how the project performed, if the schedule plan met the project aims and objectives and how improvements could be made in the future.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Be able to identify and research a suitable topic for an investigative project in the environmental and land-based sector
2. Be able to plan for an investigative project in the environmental and land-based sector
3. Be able to carry out an investigative project in the environmental and land-based sector
4. Be able to report on an investigative project in the environmental and land-based sector

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

n/a

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge

Unit 302 Undertake an Investigative Project in the Land-based Sector

Outcome 1 Be able to identify and research a suitable topic for an investigative project in the environmental and land-based sector

Assessment Criteria

The learner can:

1. List **information sources** relevant to the topic to be researched
2. Carry out **research** into potential topics
3. **Select and describe** a relevant investigative project topic in the environmental and land-based sector
4. **Prepare a proposal** for an investigative project

Range

The topics for the investigative project should reflect both learner interest and the qualification undertaken

Unit content

Information sources

For example textbooks, journals, magazines, internet, trade literature, television and radio, subject experts, validity and reliability

Research

Methods appropriate to the project, e.g. literature review, trials, experiments, practical activities, questionnaires, interviews, surveys

Select and describe

Suitable project topic (e.g. trial or experiment, investigation of an issue important to the sector, preparation of a plan, production of a structure or artefact, training programme, preparation for and participation in a competition, improving a process, investigation of a new product or service). Justify the selection of the project topic in relation to e.g. programme of study, interests and experience, future employment ambitions, comparison with alternative topics

Prepare a proposal

Title, aims/ objectives, methodology, information sources, resources (e.g. people, computers, materials, etc. required for completion of the project), justification of proposed project

Unit 302 Undertake an Investigative Project in the Land-based Sector

Outcome 2 Be able to plan for an investigative project in the environmental and land-based sector

Assessment Criteria

The learner can:

1. **Plan operations and resources** required to carry out a selected investigative project in the environmental and land-based sector
2. Explain the **reasons** for resources selected

Range

The topics for the investigative project should reflect both learner interest and the qualification undertaken

Unit content

Plan operations

Project planning techniques (e.g. critical path analysis, Gantt charts), sequencing of activities, working to deadlines, allowing for other commitments, project action plan: aims, objectives, specific operations / tasks, start and completion dates, time required, resources required, possible disruptions to plan (e.g. illness, other commitments, resource problems, IT problems, research problems, lack of cooperation, cost), contingencies and remedial actions

Resources

People, time, buildings, equipment, animals, materials, literature and media (internet, trade magazine), IT applications and budget

Reasons

Suitability, availability and cost

Unit 302 Undertake an Investigative Project in the Land-based Sector

Outcome 3 Be able to carry out an investigative project in the environmental and land-based sector

Assessment Criteria

The learner can:

1. **Carry out a selected investigative project** in the environmental and land-based sector
2. **Monitor progress**, working to **deadlines**
3. Discuss the **health and safety implications** of the investigative project

Range

The topics for the investigative project should reflect both learner interest and the qualification undertaken

Unit content

Carry out a selected investigative project

Suitable project as proposed in outcome 1(trial or experiment, investigation of an issue important to the sector, preparation of a plan, production of a structure or artefact, training programme, preparation for and participation in a competition, improving a process, investigation of a new product or service). Implementation (set up, start), operations (tasks, duties), evidence of actions e.g. literature review, artefacts, plans, presentations, witness statements, photographs or videos

Monitor progress

Diary or log of actions, monitoring of performance against schedule plan e.g. daily, weekly, monthly progress, budget, other appropriate measures for each resource or task, reasons and remedial actions if falling behind schedule

Deadlines

Interim, key mileposts, final, all to be reviewed at regular intervals by tutor

Health and safety implications

Health and safety, risk assessment, Personal Protective Equipment (PPE), relevant regulations and legislation, animal welfare, codes of practice

Unit 302 Undertake an Investigative Project in the Land-based Sector

Outcome 4 Be able to report on an investigative project in the environmental and land-based sector

Assessment Criteria

The learner can:

1. **Report** on a selected investigative project in the environmental and land-based sector
2. **Evaluate achievements and areas for improvement** of a selected investigative project

Range

The topics for the investigative project should reflect both learner interest and the qualification undertaken

Unit content

Report

Report on the project selected and completed in outcomes 1-3. Written report format, oral report presentation, title, aims/objectives, review of existing literature/information, methodology, results/findings (with appropriate evidence, e.g. charts and graphs, diagrams, photographs), conclusions, Harvard referencing

Evaluate achievements

Conduct and management of the project, action plan, keeping to deadlines, problems and remedial actions, project results/findings, strengths and weaknesses

Areas for improvement

Planning, implementation, methodology, results/findings, report, topics for further investigation

Unit 302 Undertake an Investigative Project in the Land-based Sector

Notes for guidance

This unit is designed to encourage and develop independent research skills in learners provides valuable skills development for all level 3 learners and especially those looking to progress onto Higher Education. The concept of the project is applicable across all of the vocational areas in the environmental and land-based sector, and learners should be guided and encouraged to select a project topic that is particularly relevant to their interests. This could integrate with other units in their programme of study. The emphasis of the unit should be on project management and working to deadlines, as well as producing a meaningful investigative project. Much of the work will be carried out independently by learners but they must have access to appropriate tutor guidance and support.

In Outcome 1, learners will need to identify a suitable topic for their investigative project. This should be relevant to their programme of study and have a particular interest for them, for example in relation to a special area of interest, experience or future employment of study ambitions. Ideal project topics could have a practical or theoretical focus, but all projects should include potential for research into existing literature and information sources as well as a practical investigation or application, so should be chosen in agreement with the tutor. Learners are likely to need guidance on suitable project topics and tutor support to ensure that selected topics are achievable in the timescale and with the resources available. The proposal should outline the aims and objectives, information sources, resource requirements, and the methodology by which the learner intends to complete the project, as well as their justification for topic selection. If appropriate to the investigation, a hypothesis should be included as part of the methodology.

In Outcome 2, learners will need to complete a detailed action plan for completion of the investigative project within the set timescale. This should include, as a minimum:

- a detailed breakdown of all actions from starting the project up to submission of the completed project report
- resources required at each stage (and reasons for their selection)
- time expected for completion and interim target completion dates.

They should also consider possible setbacks to their planned schedule and contingency plans to ensure timely completion of the project. Learners are likely to require guidance on project planning techniques and how to compile an appropriately detailed action plan. They could be provided with a suitable template.

In Outcome 3, learners will conduct and complete their investigative project, collecting supporting evidence as appropriate, for example literature review, artefacts, witness statements, photographs or videos, etc. Whilst doing this, they should maintain a log or diary of all actions, and regularly monitor their progress against their action plan. It would be appropriate for tutors to conduct progress reviews at key stages of the project. As part of conducting the project, learners should discuss any health and safety implications of their work to humans and, if appropriate, animals, and identify any relevant legislation or codes of practice. Risk assessments may contribute to evidence of this.

In Outcome 4, learners will produce a summary report of their project and the process of its completion. This should cover, as a minimum:

- title

- aims / objectives
- review of existing literature / information
- methodology
- results / findings
- conclusions
- references

All referencing should comply with academic conventions, and learners should be given appropriate guidance on this.

The project evaluation should consider the strengths and weaknesses of the finished project and the process of its completion, the usefulness and importance of project planning, and ways in which the project could have been improved.

Some parts of the project report could be presented orally rather than in written report format.

References

Books

Applegarth, M. 1998. *The Project Management Pocketbook*. Alresford: Management Pocketbooks.

Nokes, S., Kelly, S. 2007. *The Definitive Guide to Project Management: The Fast Track to Getting the Job Done on Time and on Budget.* 2nd ed. Harlow: Financial Times Prentice Hall.

Portney, S.E. 2001. *Project Management for Dummies*. Sussex: Wiley Publishing.

Unit 303 Understand the Principles of Plant Science

Level: 3

Credit value: 5

Unit aim

This unit aims to provide learners with an understanding of the principles of plant science and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learner will have developed an understanding of how plants grow and develop, through knowledge of their structure and physiology.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Understand the function of plant structures
2. Understand the main processes of plant physiology
3. Understand plant growth and development

Guided learning hours

It is recommended that 30 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

N/a

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 303 Understand the Principles of Plant Science
Outcome 1 Understand the function of plant structures

Assessment Criteria
The learner can:
1. Identify the **major internal** and **external structures** of plants
2. Explain the **function** of the major plant structures

Unit content

Major internal structures
Cell structure (cytoplasm, organelles), parenchyma, collenchyma, sclerenchyma, xylem tissue, phloem tissue, cambium, epidermis, guard cells, and stomata

Major external structures
Root, shoots, stem, leaves, buds, flower, fruit, and seed
Specialised internal and external structures, for example pericycle, endodermis, lenticels, cotyledons, stolons, rhizomes, storage organs

Function
Photosynthesis, reproduction, support, transport, anchorage, absorption, storage, defence, attraction, aeration, respiration, division

Unit 303 Understand the Principles of Plant Science
Outcome 2 Understand the main processes of plant physiology

Assessment Criteria
The learner can:
1. Explain the major **processes** of plant physiology
2. Identify the **factors** which can **limit** the rate **of photosynthesis**

Unit content

Processes
Photosynthesis: process (equation) for photosynthesis, function of chlorophyll, functionality of guard cells and stomata, factors needed for photosynthesis to occur (light, chlorophyll, carbon dioxide, water)

Respiration: definition of aerobic and anaerobic respiration, equation for aerobic respiration, structure and function of mitochondria, diffusion, compensation point, factors influencing the rate of respiration (temperature, water availability, seasonal growth)

Uptake, transport and loss of water and nutrients: osmosis, diffusion, plasmolysis, turgor, translocation, transpiration, factors influencing transpiration (temperature, humidity, air movement, water supply, light, stomata)

Limiting factors of photosynthesis
Temperature, carbon dioxide, leaf colour, light, water availability

Unit 303 Understand the Principles of Plant Science
Outcome 3 Understand plant growth and development

Assessment Criteria
The learner can:
1. Explain the **life cycle** of selected plants

Unit content

Life cycle
Life cycle types (ephemeral, annual, biennial, perennial), process and stages of germination, types of germination (epigeal, hypogeal), types of reproduction (sexual reproduction, for example flower structures, pollination and fertilisation, seed production, dispersal), (asexual reproduction, for example vegetative propagation, parthenogenesis), primary growth of shoots and roots (cell division, cell expansion, cell differentiation, apical meristems, lateral meristems)

Unit 303 Understand the Principles of Plant Science

Notes for guidance

On completion of this unit, the learner will have developed an understanding of how plants grow and develop, through knowledge of their structure and physiology. It will be important that delivery relates to plants that are vocationally relevant to the learners- e.g. production crops for agriculture. Laboratory based practicals could help learners to explore plant physiology and structure, and a series of visits to growing crops could help learners better understand plant growth and development. Learners are required to study a range of monocotyledon and dicotyledon plants for this unit.

Outcome 1 requires the learner to identify the main internal and external structures of both monocotyledon and dicotyledon types of plants and to explain the function of the main plant structures. The outcome is mainly theory based and can be delivered by formal lectures, discussion, internet research and directed study.

Outcome 1 and 2 are directly linked as outcome 2 identifies the need for learners to explain the major processes of plant physiology and identify factors affecting photosynthesis. Learners may find it useful to undertake practical sessions, habitat surveys or site visits to a range of habitats to learn more about plant physiology and factors affecting photosynthesis.

Outcome 3 requires the learner to explain the life cycle of plants which again can be linked into outcome 1 and 2 with careful planning. Learners should visit sites where plants can be studied at appropriate development stages i.e. at different times of the year. Formal lectures, directed study and research will be required to enhance the learners understanding of the complexities of plant physiology and life cycles. It is important that a risk assessment is carried out prior to any practical activity and that suitable Personal Protective Equipment (PPE) is provided.

Visiting speakers e.g. agronomist, rangers or plant breeders could enhance relevance of the subject to learners. Work experience may be beneficial to learners looking to develop careers in the field. Development of areas within a College environment where learners are able to modify and manipulate plant environments may enhance understanding of the complexities of plants and their life cycles

References

Books

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Unit 304 Understand the Principles of Soil Science

Level: 3

Credit value: 5

Unit aim

This unit aims to provide learners with an understanding of the principles of soil science. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

This unit aims to develop the learners understanding of soil characteristics, and their relationship to crop growth and development.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Be able to investigate soil characteristics
2. Understand how soil characteristics affect plant growth and development
3. Understand how soil characteristics affect plant selection

Guided learning hours

It is recommended that 30 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

n/a

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge

Unit 304 Understand the Principles of Soil Science
Outcome 1 Be able to investigate soil characteristics

Assessment Criteria
The learner can:
1. Compare the **characteristics** of different **soil types**
2. Carry out **experiments** to determine the characteristics of a soil sample

Range

Soil types
Loams, clays, silts, sands, organic soils

Unit content

Characteristics
Properties of soil particles (clay, silt, sand), water holding capacity, aeration, stability, organic matter, pH, soil structure (crumb structure, aggregate sizes)

Experiments
Laboratory based tests (water holding capacity, soil pH, proportion of clay, silt and sand, nutrient content)

Unit 304 Understand the Principles of Soil Science

Outcome 2 Understand how soil characteristics affect plant growth and development

Assessment Criteria

The learner can:

1. Explain how **soil type and condition** affect plant growth and development
2. Explain how **soil structure and drainage** can **affect plant growth** and **development**.

Range

Soil types

Loams, clays, silts, sands, organic soils

Unit content

Soil condition

Stability, availability of macronutrients (nitrogen, phosphorous, potassium), micronutrients (for example iron, copper, manganese), nutrient retention, water retention and availability, effects of organic and inorganic fertiliser application, pH and organic matter

Effects of soil structure and drainage on plant growth and development

Rooting depth, availability of plant nutrients, drainage, water logging, compaction, effects of high soil water content (reduced oxygen availability, poor plant growth), effects of water availability to plants, effects on ability to cultivate

Unit 304 Understand the Principles of Soil Science

Outcome 3 Understand how soil characteristics affect plant selection

Assessment Criteria

The learner can:

1. Explain how **cultural techniques** affect **soil characteristics**

Range

Soil types

Loams, clays, silts, sands, organic soils

Unit content

Cultural techniques

Crop/plant rotations and crop/plant choice, nitrogen fixation

Cultivations: ploughing, minimal cultivation techniques, zero cultivation, subsoiling

Establishment: broadcasting, transplanting, precision seeding, direct drilling, use of green manures and muck inclusion

Crop maintenance: spraying and fertiliser application, damage by machine and its reduction

Harvesting and seasonality: harvesting damage

Soil characteristics

Proportions of sand, silt, clay, organic matter content, water holding capacity, air, permeability, pH, porosity

Plant life and earth worm populations

Compaction capping and smearing

Unit 304 Understand the Principles of Soil Science
Notes for guidance

This unit aims to provide learners with an understanding of the interrelationship between soil characteristics and crop growth and development, and explores soil characteristics through investigative experiments. As learners will be engaged in practical activity there should be an emphasis on safe working practices, including the use of appropriate Personal Protective Equipment (PPE), and appropriate risk assessments should be undertaken. At Level 3 it is expected that learners will take an active part in completing risk assessments, so that this becomes an integral part of all practical activity.

Delivery of this unit will involve classroom based activity, laboratory experiments and visits to sites with different soil characteristics, preferably also with a range of crop types. It is likely that learners will also need to undertake independent study and research.

In Outcome 1, learners will need to investigate a range of soil types and carry out supervised basic soil experiments to identify different soil characteristics. These could include investigating the proportion of sand, silt and clay through suspending in water, investigating the water holding capacity of different soil types, and determining soil pH.

For Outcome 2, learners will need to develop an understanding of the effects of soil characteristics on crop growth and development. This could be supported by some controlled experiments, where learners grow plants in different soil types. Delivery of this outcome could also be enhanced by visits to see different types of crops growing in different soil types. Visiting expert speakers, such as soil scientists or agronomists, could be useful, and could describe practical aspects of managing soil structure and plant nutrition.

Outcome 3 covers the effect that choice of crop has on soil characteristics, which is the basis of crop rotation principles. Delivery will include consideration of the range of consequential effects of crop choice i.e. methods of planting and harvesting, use of machinery, crop requirement for supplementary nutrients. Delivery is likely to include both classroom activity and site visits, and could be linked to learners' work placements. A guest speaker, particularly one able to discuss the relative merits of crop rotation, would add further vocational interest.

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Websites

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www.wales.gov.uk	Welsh Assembly Government
www.scotland.gov.uk	Scottish Executive Environment and Rural Affairs Department
www.dardni.gov.uk	Department of Agriculture and Rural Affairs (Northern Ireland)
www.hse.gov.uk	Health and Safety Executive
www.lantra.co.uk	Lantra SSC
www.pda.org.uk	Potash Development Association
www.rothamsted.ac.uk	Rothamsted Research
www-saps.plantsci.cam.ac.uk	The Science and Plants for Schools Website
www.soils.org.uk	British Society of Soil Science

Unit 305 Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the identification, planting and care of trees and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will be able to identify trees and shrubs by botanic name and specify woody plants that are suitable for the situation and site. In addition, learners will be able to plant a range of tree types and provide immediate aftercare. They will also be able to specify future maintenance need.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Be able to identify trees and shrubs
2. Understand the site and establishment requirements of trees and shrubs
3. Understand the planting of trees and shrubs

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW6 Plant and establish trees
TW7 Carry out post-planting protection and maintenance
TW8 Control unwanted vegetation around trees

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 305 Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture

Outcome 1 Be able to identify trees and shrubs

Assessment Criteria

The learner can:

1. Identify a range of trees and shrubs by botanical names
2. Explain the **nomenclature and taxonomy** of trees and shrubs
3. Describe **features that aid identification** of trees and shrubs in all seasons
4. Use keys and other information to identify plants by **botanical characteristics**

Range

80 trees and 40 shrubs

Unit content

Botanical names

Binomial scientific names: Genus and specific epithet

Nomenclature and taxonomy

Conventions of taxonomy and nomenclature: Carl Linnaeus, common names, binomial scientific names, authorities, kingdom, division, class, order, family, genus, species, variety and cultivar, inter-specific and inter-generic and graft hybrids, epithets

Features that aid identification

Features: leaves, buds, twigs, bark, flowers, fruit, petioles, shape, form, height, summer and winter appearance

Botanical characteristics

Leaves: form, shape, arrangement, base, tip, margin

Buds, twigs, bark, flowers, fruit, petioles

Unit 305 Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture

Outcome 2 Understand the site and establishment requirements of trees and shrubs

Assessment Criteria

The learner can:

1. Evaluate the **suitability of trees and shrubs for a variety of conditions**
2. Explain the **influence of infrastructure on the selection of trees and shrubs**
3. Describe the **plant factors that influence selection**

Unit content

Suitability of trees and shrubs for a variety of conditions

Conditions: exposed sites, confined sites, weedy sites, compacted soils, poor drainage/wet sites, shallow soil depth, dry acid soils, clay and sandy soils

Influence of infrastructure on the selection of trees and shrubs

Infrastructure: underground and overhead services, highways, footpaths, rights of way, wayleaves, building foundations

Plant factors that influence selection

Factors: ultimate size, shape, seasonal colour, flowering period, hardiness, ability to cope with site specific conditions, aesthetic value, root spread, fruit production, possible seasonal nuisance, arboricultural or silvicultural merit

Unit 305 Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture

Outcome 3 Understand the planting of trees and shrubs

Assessment Criteria

The learner can:

1. Review the **range of planting stock**
2. Evaluate the **equipment available for planting trees**
3. Evaluate the use of **conditioners and ameliorants in tree planting**

Unit content

Range of planting stock

Stock types: transplants, undercut, cuttings, plugs, whips, feathered trees, light standard, standard, heavy standard, semi mature.

Stock categories: bare-root, root balled, containerised

Equipment available for planting trees

Manual spade types for different conditions: Standard, Schlick, Mansfield, graft, spike,

Tree planting machines: hydraulic tree spades, rotary planters, and augers

Conditioners and ameliorants in tree planting

Conditioners and ameliorants: fertilisers, organic materials, mycorrhizae, water retention materials

Unit 305 Understand and Carry Out Identification, Planting and Establishment of Trees and Shrubs for Forestry and Arboriculture

Notes for guidance

This unit is designed to provide the learner with the knowledge and skills required to successfully identify plants and care for trees appropriate to the area of study. The unit should cover as wide a range of planting and aftercare techniques as possible, appropriate to the area of study as well as those locally or regionally significant to the learners.

Throughout the unit, the emphasis should be on safe working and sound environmental practices. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is not a requirement for the learner to operate machinery to clear and prepare sites for planting or use hydraulic tree spades, but if machinery is used it must comply with relevant requirements of the Provision and Use of Work Equipment Regulations (PUWER) 1998. Health and safety issues relevant to any machinery and equipment used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is not a requirement for the learner to use fertilisers, pesticides or other methods of tree protection which require legal approval. Simulation and demonstration could be used to illustrate appropriate methods and equipment which are commonly used, but are unavailable to the learner.

In Outcome 1, the learner will be required to identify trees and shrubs. It is accepted that this outcome will require formal delivery but it should be primarily delivered in practical situations. Learners should be given sufficient opportunity to identify a wide range of woodland and amenity trees in their growth and dormant stages. Learners should be encouraged to collect and preserve specimens as a means of improving their identification skills.

In Outcome 2, the learner will be required to understand the site and establishment requirements of trees appropriate to their area of study. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be primarily delivered in practical situations. The learner should be given the opportunity to study the interaction between trees and infrastructure, as well as successful and unsuccessful planting combinations. The learner should also consider the aesthetic value of tree and shrub combinations and how this influences site establishment.

In Outcome 3, the learner will be required to understand the planting of trees and shrubs. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be primarily delivered in practical situations. The learner should be able to study a wide range of site conditions and planting requirements that will inform the choice of tree species, as well as the choice of planting methods and stock.

A learner working towards level 3 is likely to have experience of practical forestry activities. This unit aims to extend the learners knowledge and skills involved with ensuring the successful planting and aftercare of healthy trees and shrubs. Emphasis should be placed not only on 'doing', but also upon the importance of planning and strategies to ensure safe, efficient and effective operations. It is important that the learner understands the importance of maintaining an awareness of current legislation and Codes of Practice in relation to planting and aftercare work.

Centres are encouraged to introduce employers and specific professionals from the forestry and arboriculture industries, such as planting contractors and landscape architects, to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites, such as tree nurseries, as well as trade shows to add depth to the learner experience. In addition, current and topical issues regarding tree planting and aftercare should be highlighted when they arise.

It is anticipated that this unit will be delivered through supervised practical training and the learner will be able to consolidate operational skills within realistic working environments. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of tree planting and the impact of weather extremes on operations.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to work with a range of planting stock in different situations which reflects current industry practice.

Reference

Books

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Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Journals

Arboricultural Association newsletter

Forestry and British Timber

Quarterly Journal of Forestry

Unit 306 Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection for Forestry and Arboriculture

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of tree and shrub establishment and protection and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will understand the importance to society and the environment of tree establishment. The objectives of tree establishment, possible financial support and legal considerations will also be examined. The learner will also develop their understanding of the limitations of common establishment and protection methods and be able to develop their practical skills to establish and protect either amenity or forest trees.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand the environmental and legal considerations relevant to tree establishment and protection
2. Be able to plan and prepare for successful amenity or forestry establishment
3. Be able to plant trees and shrubs
4. Know the aftercare requirements of trees and shrubs

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW4 Clear sites for tree planting
TW5 Cultivate sites for tree planting
TW6 Plant and establish trees
TW7 Carry out post-planting protection and maintenance
TW8 Control unwanted vegetation around trees

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 306 Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection

Outcome 1 Understand the environmental and legal considerations relevant to tree establishment and protection

Assessment Criteria

The learner can:

1. Explain the **benefits to society** of tree establishment
2. Compare sources of **financial support** available for tree establishment and protection
3. Evaluate the **environmental considerations** associated with tree establishment and protection
4. Summarise the **legal considerations** associated with tree establishment and protection

Unit content

Benefits to society

Reduced pollution, improved air quality, increased employment prospects, increased visitors, increased property values, increased access to the countryside, healthier lifestyles, reduced energy consumption, financial benefits, regeneration of derelict and industrial land, improved landscapes, increased wildlife habitat and diversity

Financial support

Commercial loans, sponsorship, grants (e.g. Forestry Commission administered schemes)

Environmental considerations

Awareness of requirements under control of pollution legislation, oil and fuel spillage and storage, soil stability and erosion, soil compaction, nesting and breeding seasons, protected species, waste disposal, watercourses, archaeology, brash matting

Legal considerations

Health and Safety at Work etc Act 1974, Management of Health and Safety at Work Regulations 1992 (as amended 1999), Control of Substances Hazardous to Health (2002) (COSHH), Environmental Protection Act 1990 (as amended 1995), Food and Environmental Protection Act 1990 (as amended 1995), Wildlife and Countryside Act 1981 (as amended 1991), Plant Health Act 1967, Forestry Act 1967 (as amended 1991)
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides
Warning symbols, risk assessment, operator training, Personal Protective Equipment (PPE), safety devices, pre-start checks, phytosanitary certification and import requirements

Unit 306 Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection

Outcome 2 Be able to plan and prepare for successful amenity or forestry establishment

Assessment Criteria

The learner can:

1. Select **planting stock and materials**
2. Evaluate **methods of site preparation**
3. Produce **planting specifications**
4. Carry out **site clearance and preparation works**

Unit content

Planting stock and materials
Stock types: bare-root, transplants, undercut, container grown, cuttings, whips, feathered trees, half-standards, standards

Methods of site preparation
Surface preparation: mowing, herbicide application, use of rotavators (pedestrian and tractor mounted)
Mechanical and soil preparation: ploughing and cultivation including subsoiling, use of borers (handheld and tractor mounted), use of tree spades, slitters, rotavators, spading machines
Hand preparation of soil: digging with spades, slitting

Planting specifications
Planting stock: species, quantity, quality and type
Planting method: mound planting, notch, pit planting, tree spades
Planting protection: tree shelters, fencing, guards, mulching
Equipment, storage and transport, planting density, fertilisers, irrigation

Site clearance and preparation works
Correct operation of appropriate manual, motor-manual or mechanised methods (dig, plough, rotavate, scarify, chip)
Maintain equipment appropriately: inspect and adjust, service, clean and store
Correct working techniques, correct operation of equipment, safe working practices, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Unit 306 Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection

Outcome 3 Be able to plant trees and shrubs

Assessment Criteria

The learner can:

1. Plant bare-root and containerised stock safely
2. Provide **appropriate support and immediate aftercare** to trees safely

Unit content

Plant bare-root and containerised stock safely

Undertake site clearance and preparation works: correct operation of appropriate manual, motor-manual or mechanised methods (dig, plough, rotavate, scarify, chip)
Maintain planting equipment: inspect and adjust, service, clean and store
Appropriate planting method: mound planting, notch, pit planting, tree spades
Plant trees: work to planting specifications, check stock against order, correct transport and storage, distribution to ensure efficient planting, appropriate planting density and depth (too deep cultivation leads to a plant slumping in a planting hole), correct working techniques, safe working practices, appropriate disposal of waste, leave worksite in a tidy condition, prevention of pollution, minimise environmental impact

Appropriate support and immediate aftercare

Support: stakes, frames, guys, ground anchors, treeshelters
Aftercare: fertilisers, irrigation, pruning, pesticides, mulch

Unit 306 Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection

Outcome 4 Know the aftercare requirements of trees and shrubs

Assessment Criteria

The learner can:

1. Describe **methods of protecting trees**
2. Review the **use of tree supports**
3. Describe the **aftercare requirements of trees**

Unit content

Methods of protecting trees

Protection methods: tree shelters, fencing, guards, mulching, tree cages

Use of tree supports

Supports: guys, anchors, stakes, guards

Aftercare requirements of trees

Aftercare: inspection, beating-up, nutrition, formative pruning requirements, irrigation, mulching, adjustment/removal of support, weeding/competition management, use of pesticides

Unit 306 Understand and Carry Out Tree and Shrub Planting, Aftercare and Protection

Notes for guidance

This unit is designed to provide the learner with the sound knowledge and skills required to successfully establish and protect trees appropriate to the area of study. The unit should cover as wide a range of establishment and protection techniques as possible, appropriate to the area of study as well as those locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working and sound environmental practices. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for learners to operate machinery to clear and prepare sites for planting therefore health and safety issues relevant to the machinery used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is not necessary for the learner to use fertilisers, pesticides or other methods of tree protection which require legal approval. Simulation and demonstration could be used to illustrate appropriate methods and equipment which are commonly used, but which are unavailable to the learner.

In Outcome 1, the learner will be required to understand the environmental and legal considerations appropriate to tree establishment and protection. It is accepted that this outcome will require formal delivery but it should be primarily delivered in practical situations and linked to the delivery of the other learning outcomes in this unit.

In Outcome 2, the learner will be required to successfully plant and establish either amenity or forest trees. The range of planting stock may vary according to the planting sites and associated specifications, but learners should plant at least two types of planting stock, using two planting methods and two types of tree protection, which are appropriate to their area of study. This work should be undertaken on a minimum of two different sites.

In Outcome 3, the learner will be required to successfully plant trees and shrubs. The range of planting stock may vary according to the planting site and associated specification, but this work should be undertaken on a minimum of two different sites. The learner should have access to sufficient planting stock and equipment in a realistic industrial situation.

In Outcome 4, the learner will be required to know the aftercare requirements of trees and shrubs. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be primarily delivered in practical situations. The learner should be given the opportunity to visit established planting schemes and review the range of aftercare, support and protection methods and techniques available.

A learner working towards level 3 is likely to have experience of practical forestry or arboricultural activities. This unit aims to extend the learner's knowledge and skills involved with ensuring the successful establishment and protection of healthy trees and forests. Emphasis should be placed not only on 'doing', but also upon the importance of planning and strategies to ensure safe, efficient and effective operations. It is important that the learner understands the importance of maintain an awareness of current legislation and Codes of Practice in relation to establishment and protection work.

Centres are encouraged to introduce employers and specific professionals from the forestry and arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner's experience. In addition, current and topical issues regarding tree establishment and protection should be highlighted as and when they arise.

It is anticipated that the delivery of this unit will be delivered through supervised practical training and the learner be able to consolidate operational skills within realistic working environments. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of tree planting and the impact of weather extremes on operations.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to work with a range of equipment and machinery in different establishment situations which reflects current industry practice.

References

Books

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Journals

Arboricultural Association newsletter
Forestry and British Timber
Quarterly Journal of Forestry

Unit 307 Undertaking Land-based Machinery Operations

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the principles of land-based machinery operations and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learners will study the purpose and operation of land-based machines including machine layout, systems and controls. They will explore daily checks and adjustments as well as appropriate Personal Protective Equipment and the legal and recommended requirements for land-based machinery. They will learn how to safely operate and maintain machinery and consider the different conditions in which machinery might need to operate.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand the purpose and operation of land-based machines
2. Be able to prepare land-based machines ready for work
3. Be able to safely operate land-based machinery
4. Be able to carry out operator maintenance and simple repairs

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU28 Prepare for and maintain equipment and machines

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge

Unit 307 Undertaking Land-based Machinery Operations

Outcome 1 Understand the purpose and operation of land-based machines

Assessment Criteria

The learner can:

1. Explain the purpose and **safe operation** of selected land-based machines
2. Discuss the **differences between selected land-based machines**

Range

A range of modern land-based machines designed for the production of a seedbed, cutting or handling of grass swaths, application of materials, harvesting of crop

Unit content

Safe operation

Need for operator training, certification process, Health and safety at Work etc Act1974, Provision and Use of Work Equipment Regulations 1998 (PUWER), Environment Act 1995, Control of Substances Hazardous to Health 2002 (COSHH), Personal Protective Equipment (PPE), manual handling, risk assessments, codes of practice

Differences between Land-based machines

Trailed or mounted, powered or non powered, mechanical, electric or hydraulic powered, wheels, skids or hydraulic pressure accumulation, cutting, gathering, conveying; belts, chains, shaft drives; vacuum, pressure, gravity; swath width, bout width, row width, depth control

Unit 307 Undertaking Land-based Machinery Operations

Outcome 2 Be able to prepare land-based machines ready for work

Assessment Criteria

The learner can:

1. **Prepare selected land-based machinery** ready for work safely
2. Review the **pre-start checks** and **safety requirements** for selected land-based machinery

Range

A range of modern land-based machines designed for the production of a seedbed, cutting or handling of grass swaths, application of materials, harvesting of crop

Unit content

Prepare selected land-based machines

Power unit suitability, removal from storage, cleaning, damage inspection, correct hitching, free movement of working components/controls, connection to power unit, wheel and tyre maintenance, braking and lighting requirements, lubrication, calibration, tying/wrapping materials, initial field settings

Pre-start checks

Power drive shaft condition, decontaminated, safety overload devices, fuel/oil requirements, tyre pressures and conditions, lighting controls including brakes, belt tensions

Safety requirements

Guards, safety rails, steps, safe attachment to power unit, component security, information decals

Unit 307 Undertaking Land-based Machinery Operations
Outcome 3 Be able to safely operate land-based machinery

Assessment Criteria
The learner can:
1. **Operate** selected land-based machinery to meet given objectives safely
2. Explain the **safe operation** of selected land-based machinery

Range
A range of modern land-based machines designed for the production of a seedbed, cutting or handling of grass swaths, application of materials, harvesting of crop

Unit content

Operate
Site risk assessments, PPE, operator instruction manual, data sheets, transport/field settings, calibration check, correct power engagement, correct machine speeds, safe/correct loading of materials, machine output checks/quality of work, field procedures, terrain, ground conditions/undulations, public access

Safe operation
Health and Safety at Work etc Act (1974), follow manufacturers' recommendations, dealer installation process, operator instruction manuals, manufacturer web sites

Unit 307 Undertaking Land-based Machinery Operations

Outcome 4 Be able to carry out operator maintenance and simple repairs

Assessment Criteria

The learner can:

1. Carry out **operator maintenance** and appropriate **repairs** for selected land-based machinery
2. Assess **potential faults** and/or **defective parts** on a given land-based machine

Range

A range of modern land-based machines designed for the production of a seedbed, cutting or handling of grass swaths, application of materials, harvesting of crop

Unit content

Operator maintenance

Manufacturers' service schedules/instructions, lubrication, cleaning, assessment of wear tolerances, component replacement disposal of waste

Repairs

Framework welds, joints, distortion, fractures, leaking pipes, connections

Potential faults

Uneven groundwork, crop damage, inaccurate outputs, incorrect linkage settings, incorrect drawbar settings, uneven tyre pressures, incorrect track widths, power unit unsuitable, blockages

Defective parts

Belts, chains, bearings, loose splines, shares/tines, blunt/missing knives, rotor balance, nozzles/filters, and seals

Unit 307 Undertaking Land-based Machinery Operations
Notes for guidance

This unit is designed to give learners knowledge, understanding and practical skills to enable them to recognise and understand the working principles of land-based machines typically used in their area of study.

Learners will be able to demonstrate pre start checks, initial settings and safe start up techniques for a range of selected machines prior to connecting the machine to a suitable power unit and preparing machine and power unit for work. An emphasis will be put on the correct use of manufacturers' recommended procedures and respect for health and safety issues and conformation of relevant safe working practices.

It is envisaged that all learners, prior to studying this unit will have received training in the use of tractors and have been assessed as having reached a level of competence to allow practical tasks to be demonstrated safely. Learners must show awareness and consideration of hazards and risks at all times, particularly during fieldwork situations where levels of risk may vary ay any given time.

Where possible, non-simulated field work should be programmed into the learning period to take into account seasonal opportunities. Following field operations, learners will demonstrate simple maintenance and pre storage tasks to minimise degeneration of the machine and to ensure the machine is in a useable condition for subsequent operations.
The range of machinery covered should include electric vehicles and machines if appropriate.

In Outcome 1, learners must demonstrate knowledge and understandings of the construction and working principles of a selection of Land-based machines commonly used in their area of study and demonstrate knowledge of the work and performance parameters of such machines.

In Outcome 2, learners will demonstrate an ability to prepare the machine for field operations and ensure that the machine is matched and correctly connected to a suitable power unit. Machines are to be selected from the 'range/scope' list outlined in the unit content. It is essential that manufacturers' recommendations be followed to enable machines to be initially set to achieve given fieldwork criteria.

In Outcome 3, learners will need to explain safe operational procedures and carry out risk assessment prior to engaging in fieldwork. Suitable field procedures are to be demonstrated, regular checks to be made on machine performance and necessary adjustments made to both machine and power unit to meet given fieldwork criteria economically and efficiently.

In Outcome 4, following fieldwork operations, learners must carry out pre-storage maintenance, carry out an inspection to identify and subsequently rectify any faults. Wearing components will need to be assessed and replaced if wear limits are reached. Throughout the unit the emphasis will be on safe, legal practices, working to manufacturers' recommended procedures and attention to detail when recording information.

Depending on the Land-based area the learner is studying, formal lecture delivery may be generic to all areas but practical experiences and learning should be appropriate to the area of study.

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Books

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Culpin, C. 1992. *Farm Machinery* 12th ed. Sussex: Wiley Publishing. ISBN 063203159X

Journals

Farmers Weekly
Amenity Machinery and Equipment
Profi International

Websites

www.hse.gov.uk Health and Safety Executive
Manufacturer's websites

Unit 308 Undertake Advanced Arboricultural Practices

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of advanced arboricultural practices and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will safely climb trees and select and use appropriate equipment to inspect trees as well as undertake a range of preventative and remedial operations. The range of pruning cuts and techniques will be examined in conjunction with trees' responses to wounding, with emphasis on how to relate this to the tree care decision making process. In addition, the learner will undertake advanced felling techniques and dismantle trees.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Be able to carry out aerial inspections of trees
2. Be able to carry out pruning operations within tree canopies
3. Understand how to dismantle trees

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW26 Support colleagues undertaking off ground arboricultural operations
TW30 Carry out aerial pruning of a tree from a rope and harness
TW41 Survey and inspect trees

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 308 Undertake Advanced Arboricultural Practices
Outcome 1 Be able to carry out aerial inspections of trees

Assessment Criteria
The learner can:
1. Discuss factors relevant to the inspection of trees from the ground
2. Carry out a **pre-climbing assessment of a tree**
3. Review the **methods and equipment commonly used to safely access, position and move within the canopy of a tree**
4. **Select and inspect appropriate specialist equipment and working methods to access trees safely and move effectively within the canopy**
5. **Access the canopy of the tree safely and effectively move within the canopy to inspect trees**
6. Assess trees requiring preventative or remedial works and **produce a schedule of work** to meet the requirements for those trees

Unit content

Pre-climbing assessment of a tree
Identification of hazards and risk levels: site and ground conditions, weather conditions, tree condition, task, public access and rights of way/highways, power lines, noise levels
Risk control and reduction: establishment of safety zones, emergency procedures, rescue equipment, first aid provision, refuelling site, Personal Protective Equipment (PPE)
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Methods and equipment commonly used to safely access, position and move within the canopy of a tree
Safe access methods: ladders, Mobile Elevated Work Platforms (MEWPs), rope and harness, throwlines, climbing irons
Climbing and lowering ropes: static, semi-static, dynamic
Climbing knots: prussik, bowline, figure-of-eight
Harnesses, karabiners, strops, slings, throwlines, friction devices, rope grabs, cambium savers, pulleys

Select and inspect appropriate specialist equipment and working methods to access trees safely and move effectively within the canopy
Select working methods: access methods, work positioning systems
Select and inspect equipment: equipment appropriate to selected working methods, definition and status of a 'competent person', requirements for independence
Certificates of Conformity, categories of equipment, appropriate examination intervals, marking of individual items of equipment, wear patterns and types of damage, wear limits and tolerances

Access the canopy of the tree safely and effectively move within the canopy to inspect trees

Access and move within the canopy: selection of appropriate anchor points and supplementary anchor points, changing of anchor points, rope organisation, branch walking, controlled descent, retrieval and correct storage of equipment

Inspect trees: tree health and condition, decay detection, signs and symptoms of pests and pathogens, tree dimensions, mechanical defects

Produce a schedule of work

Method statement and tree work specifications: tree pruning or removal, pest or pathogen monitoring, control or prevention, prioritisation of work

Unit 308 Undertake Advanced Arboricultural Practices

Outcome 2 Be able to carry out pruning operations within tree canopies

Assessment Criteria

The learner can:

1. Summarise **current codes of practice and legislation appropriate to aerial tree works**
2. Explain the **variety and appropriateness of pruning cuts**
3. Explain how current theory on wound responses in trees informs and directs pruning methods and techniques
4. Review **specialist equipment and techniques** available for **aerial tree works**
5. Select and inspect appropriate specialist equipment and working methods to access trees safely and move effectively to carry out preventative and remedial pruning in tree canopies
6. Access the canopy of the tree safely and effectively move within the canopy to carry out preventative and remedial pruning in tree canopies

Unit content

Current codes of practice and legislation appropriate to aerial trees works

Town and Country Planning Act 1961 (as amended 1990), Town and Country Planning (Trees) Regulations 1999, Provision and Use of Work Equipment Regulations 1998 (PUWER), Lifting Operations and Lifting Equipment Regulations 1998 (LOLER), Work at Height Regulations 2005, Health and Safety at Work etc Act 1974, Management of Health and Safety at Work Regulations 1992 (as amended 1999), Wildlife and Countryside Act (1981) (as amended 1991, Countryside and Rights of Way Act 2000
Requirements for inspection of equipment, risk assessments, Personal Protective Equipment (PPE), establishment of safety zones, emergency procedures, rescue equipment, first aid provision, appropriate disposal of waste, protected species, definition of 'reckless', prevention of pollution, minimise environmental impact
British Standard 3998, AFAG Safety Guides

Variety and appropriateness of pruning cuts

Timing of operations, natural target pruning, branch collars, branch bark ridge, appropriate tools and equipment, British Standard 3998, crown thinning, crown reduction, crown lifting, brashing, pollarding, coppicing, deadwooding

Specialist equipment and techniques

Access: climbing equipment (ropes, knots, friction devices and harness), ladders and use of Mobile Elevated Work Platforms (MEWPs)
Pruning equipment: secateurs, loppers, hand saws, pole saws, chainsaws, pole chainsaws
Appropriateness, ease of use and access, legislative requirements
Movement within the tree: changing of anchor points, re-directs, additional aids (slings, strops)
Communication with ground staff
Lowering of limbs and prunings

Aerial tree works

Pruning: preventative and remedial
Preventative and remedial pruning
Crown-lifting, crown-thinning, crown-reduction, crown-cleaning, pollarding, reshaping

Unit 308 Undertake Advanced Arboricultural Practices
Outcome 3 Understand how to dismantle trees

Assessment Criteria

The learner can:

1. Describe the **tools and equipment available for dismantling trees, in a variety of situations**
2. **Select and inspect appropriate specialist equipment** to dismantle trees
3. **Access the canopy of trees safely and effectively move within the canopies to remove all branches**
4. Explain how to remove branches and **fell the main stems**

Unit content

Tools and equipment available for dismantling trees, in a variety of situations

Cutting equipment: chainsaws, secateurs, handsaws, loppers, polesaws
Access and lowering equipment: harnesses, lowering and climbing ropes, knots, karabiners, ladders, cranes, climbing irons, strops, slings, throwlines, friction devices, rope grabs, cambium savers, pulleys

Select and inspect appropriate specialist equipment

Select specialist equipment: chainsaws, secateurs, handsaws, loppers, polesaws, lowering and climbing ropes, friction devices, climbing irons, harnesses, karabiners, strops, slings, throwlines, friction devices, pulleys
Inspect equipment: equipment appropriate to selected working methods, definition and status of a 'competent person', requirements for independence, Certificates of Conformity, categories of equipment, appropriate examination intervals, marking of individual items of equipment, wear patterns and types of damage, wear limits and tolerances

Access the canopy of trees safely and effectively move within the canopies to remove all branches

Access and work positioning within the canopy: safe ascent, selection of appropriate anchor points and supplementary anchor points, changing of anchor points, rope organisation, branch walking, controlled descent, retrieval and correct storage of equipment
Branch removal: select appropriate equipment, correct working techniques, correct cutting techniques, correct operation of equipment, safe working practices, safe lowering of cut material, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Fell the main stems

Selection of felling direction and lowering where appropriate, safe and efficient chainsaw operation, appropriate Personal Protective Equipment (PPE) worn, appropriate work positioning, monitoring of chainsaw performance, appropriate sequence of cuts, adequate hinge, effective communications, awareness of hazards and escape routes, safe working distances, use of felling aids, work site left in a safe and tidy condition

Unit 308 Undertake Advanced Arboricultural Practices
Notes for guidance

This unit is designed to provide the learner with knowledge and the skills required to safely undertake advanced arboricultural operations. Consideration should be given to the seasonal nature and timing of tree inspections, with regard to when signs and symptoms may most easily be found.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of basic safe working practices in chainsaw and aerial treework, as well as familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for the learner to operate machinery and climb trees, therefore health and safety issues relevant to the operation of the machinery used and aerial treework must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessments. Learners must hold the relevant Certificate of Competence in the Safe Use of Chainsaws if they are using one.

Any legal permission required to prune or fell trees must be obtained and equipment/machinery being used must comply with relevant requirements of the Provision and Use of Work Equipment Regulations (PUWER) 1998 and Lifting operations and Lifting Equipment Regulations 1998 (LOLER). Adequate Personal Protective Equipment (PPE) appropriate to the learner, the equipment and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual.

In Outcome 1, the learner will be required to carry out aerial inspections of trees. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner will be able to consolidate operational skills within realistic working environments. It is expected that the learner will be given access to appropriate climbing and access equipment to undertake this outcome and to have received sufficient preparatory training in safe tree climbing and work positioning techniques. The learner should be encouraged to inspect trees within a range of management situations and meet with Local Planning Authority tree officers and statutory undertakers to discuss real case studies of the need for tree inspections.

In Outcome 2, the learner will be required to carry out pruning operations within tree canopies. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments. It is necessary for the learner to be given access to appropriate climbing and access equipment to undertake this outcome and to have received sufficient preparatory training in the safe use of tree climbing, pruning equipment and work positioning. It is also necessary for the learner to be given the opportunity to undertake a range of types of pruning work in realistic working environments.

In Outcome 3, the learner will be required to dismantle trees. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments. It is necessary for the learner to be given access to appropriate climbing and access equipment to undertake this outcome and to have received sufficient preparatory training in safe tree climbing, chainsaws and work positioning techniques. It is also necessary for the learner to be given the opportunity to dismantle a range of trees in realistic working environments.

In Outcomes 1, 2 and 3 the learner must not be required to work on hazardous trees or work sites where the level of risk is deemed to be unacceptable.

A learner working towards level 3 is likely to have experience of practical arboricultural activities. This unit aims to develop the learner's knowledge and skills involved with the safe use of chainsaws, tree climbing and related operations.

This unit will **not** directly lead to certification of competence in the Level 2 Award in Chainsaw and Related Operations. This unit could be used to contribute towards preparative training for the Level 2 Award in Chainsaw and Related Operations or the Level 3 Certificate of Competence.

If learners want to achieve the Level 2 Award in Chainsaw and Related Operations they will need to register and take the assessment separately through City & Guilds.

Emphasis should be placed upon 'doing' and developing practical experience, the learner should be given appropriate time to develop their skills. It is important that the learner understands the importance of maintaining an awareness of current legislation and Codes of Practice in relation to tree climbing and related operations.

Centres are encouraged to introduce employers and specific professionals from the arboricultural industry, such as contractors and consultants to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner experience. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of aerial arboricultural work and the limitations imposed by bad weather.

It is accepted that formal lectures are necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive practical lessons in a real environment. The learner should be given the opportunity to undertake a range of arboricultural operations on different sites and situations which reflects current industry practice.

References

Books

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Anon. 1995. *Health and Safety Package for Commercial Arboriculture.* Arboricultural Association. ISBN 0900978406

Anon. 2008. *A Guide to the Use of MEWPs in Arboriculture*. Arboricultural Association. ISBN 0900978449

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Shigo AL. 1989. *Tree Pruning: A Worldwide Photo Guide*. Shigo and Trees Associates. ISBN 0943563089

Journals

Arboricultural Advisory Information Service publications
Arboricultural Association newsletter
Journal of Arboriculture

Unit 309 Understanding Woodland Management

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the principles of woodland management and how these can be applied in practice. It is designed for learners in acentre-based settings looking to progress into the sector or further education and training.

This unit aims to provide learners with sufficient skills to create their own woodland management plans and to evaluate the existing management of woodlands for multipurpose objectives.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

Be able to obtain woodland data and information

1. Be able to produce woodland management plans
2. Understand woodland management objectives
3. Understand woodland management planning

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

EC24 Produce site management plans

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 309 Understanding Woodland Management
Outcome 1 Be able to obtain woodland data and information

Assessment Criteria
The learner can:
1. **Collect and record data** and information relevant to woodland
2. **Interpret data** and information collected

Unit content

Collect and record data
Physical data (roads, rides, public rights of way, surrounding land use, topography, orientation, boundary, drainage, watercourses, ponds, structures), biological data (species present, canopy structure, animals, pests, diseases), tree data (diameter at breast height (DBH), stocking density, species mix, height, basal area, volume, form, canopy height, potential value), meteorological data (temperature extremes, wind speed, wind direction, sunlight hours, rainfall), soil data (type, texture, structure, pH)

Interpret data
Collected and recorded data, Ordnance Survey maps, soils maps, site surveys, inventories, Met Office data, public records, historical records

Unit 309 Understanding Woodland Management
Outcome 2 Be able to produce woodland management plans

Assessment Criteria

The learner can:

1. Produce a **management plan** for a given woodland site including operational and health and safety requirements
2. **Present** a woodland management plan appropriately to a given audience

Unit content

Management plan

Introduction, site description, inventory, maps, collected data, appropriate management objectives, recommended objectives, schedule of activities, operational requirements, health and safety requirements, professional style

Present

Style, accuracy, logical, tables, graphs, maps, written

Unit 309 Understanding Woodland Management
Outcome 3 Understand woodland management objectives

Assessment Criteria
The learner can:
1. Discuss the **uses** of woodlands
2. Explain **potential conflicts** which may exist in relation to the use of woodlands
3. Explain selected woodland management **objectives**

Unit content

Uses
Timber production, amenity, conservation, landscape, community use, recreation, wildlife, game, sporting

Potential conflicts
Land owners, health and safety, Local Planning Authority, site management, requirements of different users, local population, facilities, access, maintenance

Objectives
Timber production, amenity, conservation, landscape, community use, recreation, wildlife, game, sporting

Unit 309 Understanding Woodland Management
Outcome 4 Understand woodland management planning

Assessment Criteria
The learner can:
1. Explain the **structure, content and presentation** of a woodland management plan
2. Explain how to achieve the best balance between present and potential woodland uses covering:
    - Legal
    - Environmental
    - Requirement of woodland users
    - Economic/financial
    - Physical
3. Explain **techniques used to assess** woodlands

Unit content

Structure, content and presentation
Introduction, site description, inventory, maps, collected data, appropriate management objectives, recommended objectives, schedule of activities, operational requirements, health and safety requirements, professional style, accuracy, logical, tables, graphs, maps, written

Legal
Felling licences, Tree Preservation Orders, Local Planning Authority, Health and Safety, Rights of Way, Wildlife and Countryside Act 1981

Environmental
Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest, National Nature Reserve, Local Nature Reserve, National Park

Requirement of woodland users
Access, community use, recreation, timber production, conservation, wildlife, game, sporting

Economic/financial
Grants available for tree planting, local funding initiatives, community forests, national funding, Forestry Commission (eWGS), sale of products, sale of services

Physical
Topography, soil type, water courses, wildlife, plants, crop species, crop age, crop density, current management plans, public roads, internal access, car parking

Assessment techniques
Surveys, usage, biodiversity, ecology surveys, Condition, Opportunity and Threat (COT) assessments, landscape character, game cover, water catchment

Unit 309 Understanding Woodland Management
Notes for guidance

This unit is designed to provide the learner with knowledge and skills required to recognise features of woodland and create functional woodland management plans. Learners will locate, collect, summarise and present a wide range of inventory data and relevant information regarding woodlands and use this to inform management decisions. They will consider relative values and attributes of different woodland sites, and appropriate management objectives for these sites. The unit should cover a range of possible activities and potential sites.

Throughout the unit the emphasis should be on safe working and sustainability. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. The importance of sustainable practices should be woven into the delivery throughout.

In Outcome 1, the leaner will be required to understand and collect different data and information relevant to woodland and be able to interpret the different data collected. Learners should look at a wide range of possible data both on sites and available from different resources. It is anticipated that the delivery of this unit will be through some formal lectures, but will mainly be delivered through independent learner research and site visits to appropriate woodland.

Outcome 2 allows the learner to put into practice knowledge gained from the other learning outcomes. It is anticipated that the delivery of this unit will contain some formal lectures and discussion, but it requires site visits to woodland and supervised classroom activities. It may be beneficial to have visiting expert speakers to add relevance to the subject particularly those that have been involved woodland management plans. Learners will develop their presentation and writing skills and an appreciation of the importance of a professional style.

In Outcome 3, the learner will develop an understanding of the management objectives relevant to different woodland. Learners will also develop an appreciation of the conflicts which can exist in relation to woodland use. It is anticipated that the delivery of this outcome will be mainly through formal lecture and discussion but the addition of guided visits to woodland managed for different objectives would add context.

In Outcome 4, the learner will develop their understanding of the woodland management planning process. It is anticipated that this outcome will be delivered mainly through formal lectures, but will benefit from interactive learner activities and supervised classroom work. A thorough understanding of what constitutes a woodland management plan and how a woodland management plan is put together will form a key element of this outcome.

This unit aims to extend the learners knowledge and skills involved with woodland management. Emphasis should be placed upon the importance of management plans and health and safety. Centres are encouraged to introduce employers and specific professionals from industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of woodlands to add depth to the learner experience and put practices into context.

It is accepted that formal lectures will be necessary at level 3, but for this unit it is recommended that they are they are linked directly with interactive lessons in a real environment including identification

sessions in the field. Learners must be given the opportunity to deal with a range of activities in different situations that reflect current industry trends.

References

Books

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Websites

www.forestry.gov.uk	The Forestry Commission
www.naturalengland.org.uk	Natural England
www.rfs.org.uk	Royal Forestry Society
www.woodlandtrust.org.uk	The Woodland Trust

Unit 310 Understand and Carry Out Forest and Woodland Skills

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of forest and woodland skills and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will be able to develop and undertake common practical skills in a range of forest and woodland settings. Specifically, be able to plant trees and manage competing vegetation, maintain drainage systems as well as erect and maintain fencing. The learner will also develop an understanding of the need to undertake these common activities and their importance for successful forest and woodland management.

Learning outcomes

There are five learning outcomes to this unit. The learner will:

1. Understand forest and woodland skills
2. Be able to control unwanted growth and vegetation in forests and woodlands
3. Be able to maintain an open drainage system within a forest or woodland
4. Be able to construct, maintain and repair forest and woodland fencing
5. Be able to set out and plant forest and woodland trees

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW2 Establish and maintain an open drainage system
TW5 Cultivate sites for tree planting
TW6 Plant and establish trees
TW8 Control unwanted vegetation around trees
CU22 Construct, maintain and repair boundaries and access points

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 310 Understand and Carry Out Forest and Woodland Skills

Outcome 1 Understand forest and woodland skills

Assessment Criteria

The learner can:

1. Evaluate tree **planting methods** and categories of **planting stock**
2. Explain the **need to remove and control** unwanted and competing growth and vegetation
3. Explain the **need to establish and maintain** open drainage systems
4. Explain **the need for forest and woodland fencing**
5. Evaluate **types of forest fencing**

Unit content

Planting methods and planting stock

Planting methods: notch and pit planting

Stock types: bare-root, transplants, undercut, container grown, cuttings, whips, feathered trees

Need to remove and control

Reduce competition (space, nutrients, light), influence characteristics of final crop, financial considerations

Need to establish and maintain

Importance of good drainage: minimum soil erosion, good soil aeration, good tree establishment and growth, prevention of water logging

The need for forest and woodland fencing

Shelter, security, exclude public and control access, protection from grazing and livestock damage, amenity value, landscape value, boundary demarcation, contain livestock

Types of forest fencing

Fence types: deer fencing, rabbit fencing, post and rail, stock fencing

Unit 310 Understand and Carry Out Forest and Woodland Skills

Outcome 2 Be able to control unwanted growth and vegetation in forests and woodlands

Assessment Criteria

The learner can:

1. **Control unwanted vegetation** around trees
2. Carry out **brashing and pruning** of trees
3. Carry out **thinning** of tree stands

Unit content

Control unwanted vegetation

Competing vegetation (woody vegetation, herbaceous vegetation, grass), select appropriate methods (herbicides, manual, motor-manual, mechanised), correct working techniques, correct operation of equipment, safe working practices and use of Personal Protective Equipment (PPE), appropriate disposal of waste, prevention of pollution, minimise environmental impact

Brashing and pruning

Reasons (access, fire control, formative, financial, amenity, timber quality), select appropriate methods (eg manual, motor-manual) correct working techniques, correct operation of equipment, safe working practices, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Thinning

Reasons (access, financial, amenity, timber quality), thinning types (systematic, selective), select appropriate methods (manual, motor-manual, mechanised), correct working techniques, correct operation of equipment, safe working practices, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Unit 310 Understand and Carry Out Forest and Woodland Skills

Outcome 3 Be able to maintain an open drainage system within a forest or woodland

Assessment Criteria

The learner can:

1. Identify **drainage problems**
2. **Maintain** an open drainage system

Unit content

Drainage problems

Blocked or obstructed drain, waterlogging, soil erosion, poor soil aeration, reduced tree growth, inappropriate route, inappropriate profile, inappropriate depth, inappropriate grade and inappropriate flow rate

Maintain

Re-cut banks, clear debris, work to specification (route, profile, depth, grade, flow rate), select appropriate methods (manual, mechanised), correct working techniques, correct operation of equipment, safe working practices and use of PPE, appropriate disposal of waste, prevention of pollution, minimise environmental impact.

Unit 310 Understand and Carry Out Forest and Woodland Skills

Outcome 4 Be able to construct, maintain and repair forest and woodland fencing

Assessment Criteria

The learner can:

1. **Construct and erect** forest fencing
2. **Maintain and repair** existing forest fencing

Unit content

Construct and erect

Work to specification (route, materials, access points), plan and estimate quantity of materials, select appropriate equipment (e.g. wire tensioners, hammers, post hole borers, wire cutters, PPE, correct working techniques, correct operation of equipment, safe working practices, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Maintain and repair

Work to specification, plan and estimate quantity of materials, select appropriate equipment (e.g. wire tensioners, hammers, post hole borers, wire cutters, PPE), correct working techniques, correct operation of equipment, safe working practices, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Unit 310 Understand and Carry Out Forest and Woodland Skills

Outcome 5 Be able to set out and plant forest and woodland trees

Assessment Criteria

The learner can:

1. **Prepare and cultivate sites** for tree planting
2. Correctly **handle, store, transport and distribute** planting stock
3. **Plant trees according to specifications**

Unit content

Prepare and cultivate sites

Correct operation of appropriate manual, motor-manual or mechanised methods: dig, plough, rotavate, scarify, chip

Maintain equipment appropriately: inspect and adjust, service, clean and store

Handle, store, transport and distribute

Check stock against order specification, consequences of poor handling, correct transport and storage (heeling in, cold storage, straw clamps, sheeting, and black and white bags), distribution to ensure efficient planting according to planting plan

Plant trees according to specifications

Correct stock (species, quantity, quality and type), planting density, planting method, transplant shock, planting protection (tree shelters and guards), mulching, select appropriate methods and equipment, correct working techniques, correct operation of equipment, safe working practices, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Unit 310 Understand and Carry Out Forest and Woodland Skills

Notes for guidance

This unit is designed to provide the learner with the knowledge and skills required to undertake a range of core forestry activities. The unit should cover as wide a range as possible including fencing, planting vegetation maintenance and drainage operations, to enable the learner to adapt and apply their skills and knowledge to the range of forest and woodland types they may encounter, but focus on methods locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working and good environmental practices. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for learners to operate machinery therefore, health and safety issues relevant to the machinery used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is not a requirement for the learner to use pesticides or other approved chemical methods of vegetation management. Simulation and demonstration could be used to illustrate appropriate methods and equipment which are commonly used, but are unavailable to the learner.

In Outcome 1, the learner will be required to develop an understanding and awareness of common forest and woodland skills. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be primarily delivered in practical situations and relate to the other learning outcomes in this unit.

In Outcome 2, the learner will be required to remove and control unwanted growth and vegetation. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be primarily delivered in practical situations. The type of vegetation and growth will vary according to the forest sites available, but the learner should remove and control at least two different types of vegetation, using two methods. Ideally, a suitable site should be selected to allow the learner to cover this entire outcome.

In Outcome 3, the learner will be required to maintain an open drainage system. It is anticipated that the delivery of this outcome will require minimal formal delivery and should be primarily delivered in practical situations. The type of drainage maintenance required will vary according to the forest sites available. It is expected that the learner will use manual methods to maintain the drainage system.

In Outcome 4, the learner will be able to construct, maintain and repair forest fencing. It is anticipated that the delivery of this outcome will require minimal formal delivery and should be primarily delivered in practical situations. The range of fencing options may vary according to the forest sites available and associated specifications, but the learner should construct, maintain and repair at least two types of fence.

In Outcome 5, the learner will be required to set out and plant trees. It is accepted that this outcome will require formal delivery but it should be primarily delivered in practical situations. The range of planting stock may vary according to the planting site and associated specification, but the learner should plant at least two types of planting stock, using two planting methods and install two types of

tree protection. It would be beneficial to include learning within the wider context of tree planting. For example, reference and links to the planting and establishment of specimen trees would enhance the learner's experience. In addition, current and topical issues regarding should be highlighted as and when they arise.

A learner working towards level 3 is likely to have experience of practical forestry activities. This unit aims to extend the learner's knowledge and skills involved with ensuring the successful establishment and maintenance of healthy forests and woodlands. Emphasis should be placed not only on 'doing', but also upon the importance of planning and strategies to ensure safe, efficient and effective operations. It is important that the learner understands the importance of maintaining an awareness of current legislation and Codes of Practice in relation to forest work.

Centres are encouraged to introduce employers and specific professionals from the forestry industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner's experience by studying machinery in operation.

It is anticipated that the delivery of this unit will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of forestry work and the impact of weather extremes on forestry operations.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to work with a range of equipment and machinery in different forest situations which reflects current industry practice. It is anticipated that the range of machinery may include that adapted from the construction or agricultural industries as well as purpose built equipment.

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Books

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Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Journals

Arboricultural Association newsletter
Forestry and British Timber
Quarterly Journal of Forestry

Unit 311 Measure Trees and Carry Out Woodland Sampling

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the measuring trees and woodlands and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will understand common mensuration conventions and be able to measure key tree and woodland parameters. Methods commonly used to measure the volume of felled and standing timber will also be examined. The learner will also understand sampling conventions and be able to produce sampling schemes, as well as survey and map woodlands.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Be able to measure trees
2. Be able to measure the volume of felled timber and standing trees
3. Be able to sample woodlands

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW9 Select, mark and measure trees

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 311 Measure Trees and Carry Out Woodland Sampling
Outcome 1 Be able to measure trees

Assessment Criteria
The learner can:
1. Explain why trees are **measured**
2. Explain **mensuration conventions**
3. Measure **individual tree parameters**
4. Measure **stand parameters**

Unit content

Measured
Reasons: to access harvestable volume, valuation to compile and maintain an inventory
Inventory to describe: the area distribution by species, age class, stocking and yield class, land use type, any selective systems for continuous sustainable yield

Mensuration conventions
Record keeping, over-bark and under-bark measurements, Diameter at Breast Height (DBH), diameter classes, diameter limits, forked trees, leaning trees, trees on slopes, deformed trees, coppiced stools, accuracy and precision, rounding down

Individual tree parameters
Stem diameter (DBH), basal area, height (total height, form height and timber height), accuracy of measurement and recording, selection of measuring equipment (girth tapes, callipers, measuring tapes, clinometers, relascopes), awareness of safety considerations (slips, trips, lone working)

Stand parameters
Stocking density, stand basal area, top height, accuracy of measurement and recording, selection of measuring equipment (girth tapes, callipers, measuring tapes, clinometers, relascopes), awareness of safety considerations (slips, trips, lone working)
.

Unit 311 Measure Trees and Carry Out Woodland Sampling
Outcome 2 Be able to measure the volume of felled timber and standing trees

Assessment Criteria
The learner can:
1. Measure **volume of felled timber**
2. Measure **volume of individual trees**
3. Measure **volume of forest stands**

Unit content

Volume of felled timber
Log volume (Huber's formula), timber stack volume, volume assortment tables, accuracy of measurement and recording, selection of measuring equipment (girth tapes, callipers, measuring tapes, clinometers), awareness of safety considerations (slips, trips, lone working), metric measurements, use of the 'Hoppus cubic foot' in the hardwood trade

Volume of individual trees
Volume by sectional measurement, single tree tariff charts, accuracy of measurement and recording, selection of measuring equipment (girth tapes, callipers, measuring tapes, clinometers), awareness of safety considerations (slips, trips, lone working), metric measurements, use of the 'Hoppus cubic foot' in the hardwood trade

Volume of forest stands
Tariff system, accuracy of measurement and recording, metric measurements, selection of measuring equipment (girth tapes, callipers, measuring tapes, clinometers), awareness of safety considerations (slips, trips, lone working)

Unit 311 Measure Trees and Carry Out Woodland Sampling
Outcome 3 Be able to sample woodlands

Assessment Criteria
The learner can:
1. Evaluate **sampling methods and units**
2. Evaluate the **influence of woodland structure** on sampling scheme
3. Produce a **sampling scheme**
4. **Carry out woodland sampling**
5. **Select and mark** trees for felling

Unit content

Sampling methods and units
Sampling methods (systematic sampling, simple random sampling, stratified random sampling), sampling units (point, transect and plot), plot size, plot shape, plots on boundaries, sources of bias

Influence of woodland structure
Sampling method, unit and intensity

Sampling scheme
Sampling method, sampling unit, sampling intensity, location of sampling units

Carry out woodland sampling
Adherence to sampling scheme, accuracy of measurement and recording, selection of measuring equipment (girth tapes, callipers, measuring tapes, clinometers), awareness of safety considerations (slips, trips, lone working)

Select and mark
Select: dead, dying, diseased, deformed, abnormal/'wolf' trees, reduce competition
Mark: bio-degradable tape, paint, timber scribes, blazing with slashers

Unit 311 Measure Trees and Woodland Sampling
Notes for guidance

This unit is designed to provide the learner with knowledge and skills required to measure and map trees and woodlands accurately. The unit will also allow the learner to understand the advantages and limitations of the methods commonly used by the industry and to select the most appropriate methods according to the objectives.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is expected that the learner will be given the opportunity to practice as wide a range of measurement techniques as possible on a range of different trees and woodland situations. Due to the natural variability of woodland sites, the learner should initially develop their skills on single species contiguous stands, before attempting to sample mixed or uneven aged stands.

In Outcome 1, the learner will be required to understand the current mensuration conventions and parameters employed in British forestry. It is accepted that this outcome will require formal delivery but it should also be delivered in practical situations where the learner is able to measure a range of standing trees (both conifer and broadleaved) of varying size and form. The learner should initially develop their skills on single trees in a flat open situation before dealing more complex situations. It would be beneficial to include learning within the wider context, such as the importance of obtaining accurate measurements for management purposes, such as thinning control and growth studies.

In Outcome 2, the learner will be required to measure felled timber and standing tree volume. It is anticipated that the delivery of this unit will require some formal delivery, but it should be primarily delivered in practical situations and appropriate to the area of study. It is expected that the learner will be introduced to a range of methods and given the opportunity to consider their advantages and limitations. It is not expected that the learner should need to remember a range of formulae. It would be beneficial to include learning within the wider context of measuring timber, for example comparing buying and selling timber based on volume estimates against weight sales. The learner is not required to use the Hoppus Cubic Foot as a volume measure, but should be aware of its use.

In Outcome 3, the learner will be required to understand sampling conventions employed and sample a woodland site. It is anticipated that the delivery of this unit will initially be formal delivery, but the theory and skills should be subsequently practised in woodland situations. The learner should be introduced to the characteristics used to select trees for removal. Marking can include the use of paint and timber scribes. However, invasive marking methods involving the wounding of standing trees should not be undertaken unless the trees are to be subsequently felled.

A learner working towards level 3 is likely to have experience of a diverse range of trees and woodlands. Emphasis should be placed not only on 'doing', but also upon the importance of obtaining accurate information for a range of woodland management purposes. It is important that the learner is able to access a range of mensuration, surveying and mapping equipment.

Centres are encouraged to introduce employers and specific professionals from the forestry and arboriculture industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of woodland situations to add depth to the learner experience.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive lessons in a real environment. The learner must be given the opportunity to deal with a range of trees and woodlands.

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Books

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Journals

Arboricultural Association newsletter

Forestry and British Timber

Quarterly Journal of Forestry

Unit 312 Understand the Principles and Identify the Signs of Pests and Diseases of Trees

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of pests and diseases of trees and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will develop a broad perspective of plant pathology and understand the range of common biotic and abiotic pathogens that cause disease. The signs and symptoms of common biotic and abiotic pathogens will be described and the life cycles of biotic pathogens will be examined. In addition, the learner will evaluate appropriate monitoring, prevention and control measures for common biotic pathogens.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand the principles of pathology and the common causes of disease
2. Be able to identify the signs and symptoms of common biotic and abiotic pathogens
3. Understand common biotic pathogens
4. Understand monitoring, prevention and control measures of common biotic pathogens

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU80 Plan and manage the control of pests, diseases and disorders

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 312 Understand the Principles and Identify the Signs of Pests and Diseases of Trees

Outcome 1 Understand the principles of pathology and the common causes of disease

Assessment Criteria

The learner can:

1. Summarise the **principles of pathology**
2. Identify the consequences of **pests and diseases for trees**
3. Review the **common causes** of tree diseases

Unit content

Principles of pathology

Requirements for healthy growth of trees, recognition of unhealthy trees, prevention, monitoring, identification of signs and symptoms, diagnosis, treatment, control

Pests and diseases for trees

Consequences: rot, fungal attack, damage, growth reduction, reduced vigour (increased susceptibility to further infection), loss of value, premature death, dangerous trees and risk assessment, loss of aesthetic and amenity value, pest and disease spread, legislative requirements or notifiable pests and diseases

Common causes

Biotic pathogens: bacteria, fungi, vertebrate pests (including humans), invertebrate pests, plants
Abiotic pathogens: lightning, frost, drought, nutrient deficiencies, herbicides, air pollution, wind, planting failure

Unit 312 Understand the Principles and Identify the Signs of Pests and Diseases of Trees

Outcome 2 Be able to identify the signs and symptoms of common biotic and abiotic pathogens

Assessment Criteria

The learner can:

1. Describe the signs and symptoms of **common biotic pathogens**
2. Describe the signs and symptoms of **common abiotic pathogens**
3. **Diagnose** pathogen damage to trees

Unit content

Common biotic pathogens

Bacteria
Fungi: examples of Ascomycetes, Basidiomycetes, Oomycetes
Invertebrate pests: examples of Hemiptera, Hymenoptera, Lepidoptera, Coleoptera
Vertebrate pests: rabbits, grey squirrels, deer

Common abiotic pathogens

Lightning, drought, frost, herbicides, poor soil aeration, nutrient deficiencies, road salt, air pollution

Diagnose

Equipment and sampling, use of identification keys

Unit 312 Understand the Principles and Identify the Signs of Pests and Diseases of Trees

Outcome 3 Understand common biotic pathogens

Assessment Criteria

The learner can:

1. Discuss the **life cycles** of common invertebrate, vertebrate, fungal and bacterial pathogens
2. Explain the **significance of the life cycle for correctly identifying pathogens**
3. Describe host and pathogen **relationships**

Range

Bacteria
Depending upon which qualification is being delivered, one of the following categories needs to be covered:
Fungi: examples of Ascomycetes, Basidiomycetes, Oomycetes
Invertebrate pests: examples of Hemiptera, Hymenoptera, Lepidoptera, Coleoptera
Vertebrate pests: rabbits, grey squirrels, deer

Unit content

Life cycles

Reproduction methods and rates, breeding seasons, behavioural characteristics, growth and development, social structure, preferred habitat, food supply and preferences, natural population controls, mode of movement (insect vectors, wind spores, territory)

Significance of the life cycle for correctly identifying pathogens

Significance: seasonality and timing of signs and symptoms visibility and occurrence (fruitifications, grazing damage)
Consequences of misidentification: financial, legal, environmental, reputation

Relationships

Colonisation and invasion strategies, factors promoting infection, host response mechanisms

Unit 312 Understand the Principles and Identify the Signs of Pests and Diseases of Trees

Outcome 4 Understand monitoring, prevention and control measures of common biotic pathogens

Assessment Criteria

The learner can:

1. Evaluate appropriate **monitoring methods** associated with common biotic pathogens
2. Evaluate appropriate **prevention measures** associated with common biotic pathogens
3. Evaluate appropriate **control measures** associated with common biotic pathogens
4. Produce a **suitable plan** to manage **specified biotic pathogens**
5. Outline the **legal and environmental considerations** associated with control of common biotic pathogens

Range

Bacteria
Depending upon which qualification is being delivered one of the following categories needs to be covered:
Fungi: examples of Ascomycetes, Basidiomycetes, Oomycetes
Invertebrate pests: examples of Hemiptera, Hymenoptera, Lepidoptera, Coleoptera
Vertebrate pests: rabbits, grey squirrels, deer

Unit content

Monitoring methods

Surveys and inspection: faeces, damage, timing, distribution and frequency, visual assessment, decay detection equipment, trapping, approved traps, use of pheromones

Prevention measures

Measures used to promote healthy tree growth: irrigation, feeding, approved repellents, physical barriers, fencing, tree shelters, breeding for natural resistance, species selection, plant passports and import legislation

Control measures

Approved traps, biological control: predators and parasites, shooting and culling, pesticides, fungicides, insecticides, aphicides, rodenticides, poisons, fumigants,
Pruning and sanitation felling, respiratory and Personal Protective Equipment (PPE)

Suitable plan

Plan to include: monitoring, prevention and control methods

Specified biotic pathogens

One example from each of the fungal, invertebrate and vertebrate pathogen species that negatively impact on trees

Legal and environmental considerations

Current legislation: non-target species, environmental effects of control methods, approved products, occupiers' responsibilities to visitors, risk assessment
Pests Act 1954, Plant Health Act 1967, Wildlife and Countryside Act (1981) (as amended 1991), Food and Environment Protection Act 1990 (as amended 1995), Approved Code of Practice for Using Plant Protection Products, Health and Safety at Work etc Act 1974, Control of Substances Hazardous to Health (2002) (COSHH)

Unit 312 Understand the Principles and Identify the Signs of Pests and Diseases of Trees

Notes for guidance

This unit is designed to provide the learner with knowledge and skills required to manage pests and diseases associated with a range of trees appropriate to the area of study. The unit should cover a range of pathogens as appropriate to the area of study as well as those locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is not a requirement for the learner to use pesticides or other approved methods of control. Learners must hold the appropriate Certificate of Competence (PA) or equivalents required by law to apply pesticides if they do so. Simulation and demonstration could be used to illustrate appropriate control methods which are commonly used.

In Outcome 1, the learner will be required to understand the principles of pathology and the common causes of disease. It is accepted that this outcome will require formal delivery but it should also be delivered in practical situations where learners are visually assessing trees for health and identifying unhealthy trees. The learner should be encouraged to assess a range of tree species appropriate to their area of study, with the emphasis on safe working.

In Outcome 2 the learner will be required to identify the signs and symptoms of common biotic and abiotic pathogens. It is anticipated that the delivery of this unit will require some formal delivery, but it should be delivered in practical situations and be appropriate to the area of study. It is expected that the learner will be given the opportunity to study pathogens throughout the year, with regard to when signs and symptoms may most easily be found. The specific pathogens studied should relate to the learner's area of study and provide the opportunity to become familiar with those which are locally or regionally significant.

In Outcome 3, the learner will be required to understand common biotic pathogens. It is anticipated that the delivery of this unit will require formal delivery and relate primarily to the pathogens the learner has become familiar with in Outcome 2.

In Outcome 4 the learner will be able to understand monitoring, prevention and control measures of common biotic pathogens examined in Outcomes 2 and 3. Emphasis should be placed on current legislation and Codes of Practice, and it would be beneficial to include learning within the wider context of tree health. Reference and links to anatomical features of wood and wound response in trees could be explored. Current and topical issues regarding tree health should be highlighted as they arise.

A learner working towards level 3 is likely to have experience of the promotion of the successful establishment and initial growth of healthy trees. This unit aims to extend the learner's knowledge and skills involved with ensuring the long term health of trees. Emphasis should be placed not only on 'doing', but also upon the importance of planning and strategies to promote tree health within their charge. It is important that the learner understands the importance of maintaining an awareness of current legislation and Codes of Practice in relation to tree health and disease management.

Centres are encouraged to introduce employers and specific professionals from the horticulture or forestry or arboriculture industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits throughout the year to add depth to the learner experience.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are linked directly with interactive lessons in a real environment. Learners must be given the opportunity to deal with a range of trees and pathogens in different situations which reflects current industry practice.

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Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Journals

Arboricultural Association newsletter

Forestry and British Timber

Horticultural Week

Quarterly Journal of Forestry

Unit 313 Undertake Tree and Shrub Pruning and Maintenance

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of tree and shrub pruning and maintenance and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will understand the reasons for undertaking pruning of trees and shrubs and their varying requirements, as well as the law relevant to the work. Common equipment used to undertake this work will be examined, as well as the biological processes of trees and shrubs and their impact upon pruning and maintenance work. The learner will be able to assess trees and shrubs for failure and undertake appropriate pruning and other remedial action.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Understand pruning as a means of maintaining trees and shrubs
2. Be able to prune and maintain trees and shrubs
3. Be able to assess trees and shrubs for potential failure

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW25 Support arboriculture operations
TW26 Support colleagues undertaking off ground arboriculture operations
TW38 Install structural supports for trees

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 313 Undertake Tree and Shrub Pruning and Maintenance

Outcome 1 Understand pruning as a means of maintaining trees and shrubs

Assessment Criteria

The learner can:

1. Explain the **aims and considerations** of pruning trees and shrubs
2. Evaluate **pruning techniques**
3. Explain the immediate and long term **biological processes** of trees and shrubs in response to pruning and possible consequences of not pruning
4. Summarise the **legislation relating to pruning and maintenance**

Unit content

Aims and considerations

Disease controls, improve formative appearance, restoration, deadwooding, physical access, health and safety, reduce or remove competition (space, nutrients, light), timber quality, financial considerations, client requirements, legislation

Pruning techniques

Timing of operations, natural target pruning, branch collars, branch bark ridge, appropriate tools and equipment, British Standard 3998, crown thinning, crown reduction, crown raising, crown reshaping and formative pruning, crown lifting, deadwooding, brashing, pollarding, coppicing

Biological processes

Pruning concepts in relation to energy use, wound response and closure, storage and mobilisation of energy reserves, impact of age of tree, Compartmentalization of Decay in Trees (CODIT), wound and callus growth

Legislation relating to pruning and maintenance

Stature law examples: felling licenses, planning processes, Conservation areas, Tree Preservation Orders (TPOs), Town and Country Planning Act 1961 (as amended 1990), Town and Country Planning (Trees) Regulations 1999, Forestry Act 1967 (as amended 1991)
Stature law examples: nuisance, liability, high hedges, highway trees, Health and Safety at Work etc Act 1974, Wildlife and Countryside Act (1981) (as amended 1991)

Unit 313 Undertake Tree and Shrub Pruning and Maintenance

Outcome 2 Be able to prune and maintain trees and shrubs

Assessment Criteria

The learner can:

1. Produce a **pruning and maintenance plan** for trees and shrubs
2. Carry out appropriate **pruning and maintenance** of trees and shrubs

Unit content

Pruning and maintenance plan

Survey of tree and shrub condition, tree category classes, maintenance work required, prioritisation of work, protection measures, schedule of works

Pruning and maintenance

Select appropriate methods (manual, motor-manual) and equipment, correct working techniques, correct pruning techniques, correct operation of equipment, safe working practices, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Unit 313 Undertake Tree and Shrub Pruning and Maintenance

Outcome 3 Be able to assess trees and shrubs for potential failure

Assessment Criteria

The learner can:

1. Explain the **potential of trees and shrubs for failure**
2. Carry out **assessment** of trees and shrubs for potential failure
3. Evaluate **remedial actions** for potential failure
4. **Carry out appropriate remedial action** on trees and shrubs

Unit content

Potential of trees and shrubs for failure

Decay, structural weaknesses, species characteristics, injury, growth habit, site and environmental influences and factors

Assessment

Invasive and non-invasive methods, visual inspection, Visual Tree Assessment (VTA), recognition of defects, sounding and acoustics, increment corer, fractometer, resistograph and electrical resistance

Remedial actions

Invasive and non-invasive methods, cable bracing, flexible bracing, rod bracing, propping, guying, felling, pruning

Carry out appropriate remedial action

Site inspection, select appropriate methods and equipment, select appropriate technique, correct working techniques, correct operation of equipment, safe working practices (Personal Protective Equipment (PPE), emergency communications, signage, barriers), work to specifications, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Unit 313 Undertake Tree and Shrub Pruning and Maintenance

Notes for guidance

This unit is designed to provide the learner with sound knowledge and practical skills associated with the requirement to maintain trees and shrubs by pruning. The content and context of the unit should be adapted where possible to the learner's area of study. The unit should cover a range trees and shrubs, as well as techniques and equipment, appropriate to the area of study and those that are locally or regionally significant to the learner. Consideration should be given to the seasonal nature and timing of pruning in relation to tree and shrub species, as well as when signs and symptoms associated with causes of potential failure (e.g. pathogens) may be easily observed.

It is anticipated that the delivery of this unit may initially focus mainly upon formal lectures but it is recommended that, as far as is possible, they are linked directly with interactive lessons in a real environment. Where practical learning is undertaken, the emphasis should be on safe working. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working.

Any legal permission required to prune trees must be obtained and equipment/machinery used must comply with relevant requirements of the Provision and Use of Work Equipment Regulations (PUWER) 1998. If chainsaws are used, the learner must hold a Certificate of Competence in Chainsaw and Related Operations (units CS30 and CS31) or equivalent units (CS0960 and CS0961) before working towards achieving this unit.

Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is a requirement for the learner to use pruning equipment and therefore health and safety issues relevant to the equipment used must be stressed and regularly reinforced. In addition the learner should be actively involved in comprehensive risk assessment. Simulation and demonstration could be used to illustrate appropriate equipment and techniques, such as decay detection, which are commonly used, but unavailable to the learner.

In Outcome 1, the learner will be required to understand how pruning is used to maintain trees and shrubs. It is accepted that this outcome will require formal delivery but it should also be delivered in practical situations where the learner is able to see how different environmental conditions influence tree growth and development. The learner should be encouraged to assess a range of trees and shrubs appropriate to their area of study. The learner will be able to understand UK legislation relating to pruning and maintenance of trees. Examples of real cases should be examined to illustrate the legislation and preparation or completion of appropriate documentation, such as objections to tree preservation orders (TPO) or applications to undertake pruning works. Learners should focus upon legislation specific to their location within the UK and understand the importance of maintaining an awareness of current legislation and Codes of Practice which may relate to tree pruning.

In Outcome 2 the learner will be required to plan and undertake pruning of trees and shrubs. It is anticipated that the delivery of this outcome will be in practical situations and appropriate to the area of study. It is not a requirement for the learner to climb or use other mechanisms to access tree crowns to undertake pruning for this outcome.

In Outcome 3, the learner will be required to assess trees and shrubs for potential failure. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study. The learner is required to erect structural supports in addition to pruning as remedial actions. Potential to erect structural supports will vary according to the trees available and associated requirements, but the learner should install at least two types of support. Simulation within realistic working environments may be used if real-work opportunities are not available. It would be beneficial to include learning within the wider context of potential failure. Reference and links to current biomechanical theories explaining tree structure and development would enhance the learner's understanding.

This unit will not directly lead to certification of competence in the Level 2 Award in Chainsaw and Related Operations. This unit could be used to contribute towards preparative training for the Level 2 Award in Chainsaw and Related Operations or the Level 3 Certificate of Competence in the Thorough Examination of Arboricultural Equipment.

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If learners want to achieve the Level 2 Award in Chainsaw and Related Operations they will need to register and take the assessment separately through City & Guilds.

A learner working towards level 3 is likely to have experience of the promotion of healthy establishment and growth of trees. This unit aims to extend the learner's knowledge and skills involved with ensuring the long term health and management of trees and shrubs. Emphasis should be placed on the importance of planning and implementation of strategies to promote the health of trees within their charge and the practical application of current knowledge. Current and topical issues regarding pruning should be highlighted as and when they arise.

Centres are encouraged to introduce employers and specific professionals from the horticulture, forestry or arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of establishments to add depth to the learner experience and enable them to examine pruned and un-pruned trees throughout the year.

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Quarterly Journal of Forestry
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Unit 314 Undertake Tree Surveys and Inspections and Analyse the Data

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of tree surveys and inspections and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The aim of this unit is to develop learner knowledge and skills in surveying and inspecting trees through general practical application and generation of reports following data collection. Learners will develop and integrate all aspects of tree knowledge including the identification of tree species, diseases and disorders, tree biomechanics and the legal aspects of tree management. Learners will develop report writing skills to meet different objectives.

Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. Be able to survey trees
2. Be able to inspect individual trees
3. Understand results of tree surveys and inspection

Guided learning hours

It is recommended that **60** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW32 Carry out aerial crown reduction and thinning from a rope and harness

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 314 Undertake Tree Surveys and Inspections and Analyse the Data

Outcome 1 Be able to survey trees

Assessment Criteria

The learner can:

1. Explain **why tree surveys are carried out**
2. Carry out tree surveys to **collect data to meet specific objectives**
3. Compare a **range of methods for collecting and recording data**

Unit content

Why tree surveys are carried out

Possible reasons: data acquisition, animal monitoring, vegetation distribution, inventories, tree condition, aid planning, property sales or purchases, access agreements

Collect data to meet specific objectives

Data may include: species, physical measurements, age classes, structural condition, physiological condition, signs and symptoms of pests and diseases

Possible objectives: location of tree species, safe useful life expectancy, hazard assessment, presence of bat roosts, presence of pests or pathogens, trees to be removed, landscape and amenity value, veteran tree management

Range of methods for collecting and recording data

Field techniques: field walking, transects, permanent sample plots, data loggers.

Geographic information technologies: Global Positioning System (GPS), Geographic Information Systems (GIS), remote sensing (airborne and satellite sensor systems).

Field survey techniques: equipment, Rangefinder, compass, drag tape, measuring tape, planimeters, clinometers field notebook, ruler, scale rule

Techniques: Field walking, distance and elevation

Unit 314 Undertake Tree Surveys and Inspections and Analyse the Data

Outcome 2 Be able to inspect individual trees

Assessment Criteria

The learner can:

1. Explain **why individual tree inspections are carried out**
2. Inspect individual trees to **collect appropriate data**
3. Collect data using **appropriate techniques**
4. Accurately **record data using an appropriate method**
5. Carry out inspections in compliance with **current legislation and health and safety** considerations

Unit content

Why individual tree inspections are carried out

Possible reasons: risk assessment, amenity valuation, planning proposals and applications, insurance purposes, presence of protected species, landscape impact, tree condition, hazard assessment, statutory protection, timber sale, annual work programmes

Collect appropriate data

Data may include: species, height, diameter, form, suitability for the setting, crown radius, age class, safe useful life expectancy, structural condition, and physiological condition

Appropriate techniques

Range to include non-invasive, semi-invasive and invasive techniques, increment corers, resistograph, Shigometer, Picus sonic tomography, data loggers, visual inspection, Visual Tree Assessment (VTA), Helliwell System

Record data using an appropriate method

Methods may include: data loggers, paper recording, and portable computer

Current legislation and health and safety

Health and Safety at Work etc Act 1974, Occupiers' Liability Act 1957 (as amended 1984), Management of Health and Safety at Work Regulations 1992 (as amended 1999)

Unit 314 Undertake Tree Surveys and Inspections and Analyse the Data

Outcome 3 Understand results of tree surveys and inspection

Assessment Criteria

The learner can:

1. Analyse and interpret **data from tree surveys and inspections**
2. Prepare **recommendations appropriate to inspection objectives**
3. **Report on inspected trees** and **present information**

Unit content

Data from tree surveys and inspections

Data may include: species, stocking, physical measurements, form, suitability for setting, safe useful life expectancy, structural condition, physiological condition

Recommendations appropriate to inspection objectives

Recommendations may include: tree pruning or removal, pest or pathogen control or prevention, signage or restriction of access, alleviation of ground compaction, amenity valuation e.g. Helliwell System, statutory protection, insurance claim

Report on inspected trees

Written report to include: methods used to acquire relevant data and information, evaluation methods used, recommendations for trees inspected, ancillary information used to help determine conclusions and recommendations

Present information

Written report: expert's name, address, occupation, relevant academic and professional qualifications including membership of professional institutions, career history, relevant experience, range and extent of expertise and any limitations upon the expertise, methods used to acquire relevant data and information, evaluation methods used, opinion, ancillary information used to help determine the opinion, declaration of truth

Oral report: 'Rule against hearsay evidence'

Unit 314 Undertake Tree Surveys and Inspections and Analyse the Data

Notes for guidance

This unit is designed to provide the learner with a broad knowledge and awareness of tree surveys and inspections associated with a range of trees appropriate to the learner's area of study. The unit should cover a range of survey and inspection objectives and methods as appropriate to the area of study as well as those locally or regionally significant to the learner.

It is anticipated that the delivery of this unit may initially focus mainly upon formal lectures but it is recommended that as far as is possible, they are linked directly with interactive lessons in a real environment. Where practical learning is undertaken, the emphasis should be on safe working. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working.

In Outcome 1, the learner will be required to survey trees. It is accepted that this outcome will require some formal delivery but it should be delivered in practical situations. The learner should be encouraged to survey trees within a range of management situations and meet with woodland managers and surveyors to discuss real case studies of the need for tree surveys and factors which may be considered.

In Outcome 2 the learner will be required to inspect individual trees. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study. It would be beneficial to include learning within the wider context of legal responsibilities. For example, reference and links to insurance claims and hazard assessment would enhance the learner's understanding. The learner should be encouraged to inspect trees within a range of management situations and meet with Local Planning Authority tree officers and statutory undertakers to discuss real case studies of the need for tree inspections, such as trees which may require statutory protection.

In Outcome 3, the learner will be required to understand, evaluate and present findings of tree surveys and inspection. It is anticipated that the delivery of this outcome will require formal delivery, but it should be linked to the work undertaken in outcomes 1 and 2. It would be beneficial to include learning within the wider context of reporting on tree inspections. For example, reference and links to how expert witnesses present evidence in court would enhance the learner's understanding. The learner will be able to evaluate and present findings from site inspections. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study; forestry or arboriculture. Although not essential, it would be beneficial to link delivery of this outcome with any existing tree survey or inspection work that the learner may be undertaking.

A learner working towards level 3 is likely to have experience of the management of trees with respect to good forestry and arboricultural practices. This unit aims to extend the learner's capabilities by ensuring they are given the opportunity to integrate their knowledge of trees to prepare and present recommendations for future tree management. It is important that the learner understands the practical implications of current legislation and Codes of Practice which may relate to tree survey and inspection work and the need to maintain a current awareness of legislation as it changes. In addition, relevant current and topical issues should be highlighted as and when they arise.

Centres are encouraged to introduce employers and specific professionals from the horticulture, forestry and arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of sites to add depth to the learner's experience.

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Journal of Arboriculture

Quarterly Journal of Forestry

Unit 315 Understand the Legislation Relating to Trees in the UK

Level: 3

Credit value: 5

Unit aim

This unit aims to provide learners with an understanding of the principles of legislation relating to trees in the UK and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will be able to demonstrate a working knowledge and understanding of common and statute law relating to trees, woodlands and hedgerows.

Learning outcomes

There is one learning outcome in this unit. The learner will:

1. Understand UK statute law relating to the management and protection of trees, woodlands and hedgerows

Guided learning hours

It is recommended that 30 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU78 Identify the presence of pests, diseases and disorders, and assist with their control

CU88 Manage habitats

TW23 Extract wood products using small motorised equipment

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 315 Understand the Legislation Relating to Trees in the UK

Outcome 1 Understand UK statute law relating to the management and protection of trees, woodlands and hedgerows

Assessment Criteria

The learner can:

1. Summarise how trees are **protected under current relevant legislation**
2. Explain the procedures for **undertaking works on protected trees**
3. Outline the **law relating to highway trees**
4. Explain the **difference between statute and common law**
5. Explain the **legal responsibilities of tree, hedge and woodland ownership**

Unit content

Protected under current relevant legislation

Felling licence: Forestry Act 1967 (as amended 1991), requirements for a felling licence, exemptions and statutory undertakers, offences and penalties for contravention of the legislation
Trees in hedgerows: Environment Act 1995, Hedgerow Regulations 1997, criteria for 'important', requirements for permission to remove hedgerows, exemptions and statutory undertakers, offences and penalties for contravention of the legislation
Tree Preservation Orders and Conservation Areas: Town and Country Planning Act 1990 (as amended 1990) and Town and Country Planning (Trees) Regulations 1999, how a Local Planning Authority should determine whether to offer statutory protection to trees, procedures and how statutory orders should specify the trees to be protected, requirements for permission to undertake works, exemptions and statutory undertakers, offences and penalties for contravention of the legislation

Undertaking works on protected trees

Felling licence: application to the Forestry Commission, notification and consultation process, conditions normally attached to licences
Trees in hedgerows: application to Local Planning Authority for permission to remove important hedgerows, appeals process
Tree Preservation Orders and Conservation Areas: application to Local Planning Authority for permission or consent to undertake works, notification and consultation process, appeals process, compensation

Law relating to highway trees

Highways Act 1980, ownership and responsibility of trees on highway land, planting of trees on highway land, trees obstructing highways, reasons that highway authorities may require works to trees on adjoining land, how a highway authority should serve a notice to undertake works, statutory undertakers, street works and signage

Difference between statute and common law

Statute Law: Acts of Parliament and subordinate legislation (Statutory Instruments, By-laws and Orders in Council)
Common Law: Case law, judicial statutory interpretation, substantive law and procedural law
Distinction between civil and criminal law

Legal responsibilities of tree, hedge and woodland ownership

Occupiers' Liability Act 1957 (as amended 1984), Health and Safety at Work etc Act 1974
National Parks and Access to the Countryside Act 1949, Countryside and Rights of Way Act 2000
Tree ownership and legal definition of a tree, Common law duty of care and obligations, legal nuisance and nuisance abatement, trees growing on or close to boundaries, trespass, negligence, harm due to the natural characteristics of a healthy tree, hazardous and poisonous trees, no liability in respect to a risk willingly accepted by the visitor (*volens non fit injuria*), specialist workers or knowledge, existence of warning notices and barriers, routine and adequate inspection, rights conferred by a private right of access, rights conferred by an access agreement, responsibilities for public rights of way, liability may extend to damage to visitors property

Unit 315 Understand the Legislation Relating to Trees in the UK

Notes for guidance

This unit is designed to provide the learner with a broad knowledge and awareness of Statute and Common Law relating to trees and treework in the United Kingdom. The content and context of the unit should be adapted where possible to the learner's geographical area of study to ensure sufficient account is taken of devolved legislation within the UK.

It is anticipated that the delivery of this unit may initially focus mainly upon formal lectures but it is recommended that as far as is possible, they are linked directly with interactive lessons in a real environment. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working.

In Outcome 1, the learner will be required to understand how statute law relates to the management of trees, woodland and hedgerows. It is accepted that this outcome will require formal delivery but it should also be delivered in practical situations where the learner is able to see trees which have statutory protection and understand the basis for protection being required. The learner should be encouraged to assess a range of tree management situations and meet with Local Planning Authority tree officers and statutory undertakers to discuss real case studies of tree management and protection.

The learner will also be required to understand common law requirements relating to trees, woodlands and hedgerows. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study. It would be beneficial to include learning within the wider context of legal responsibilities. For example, reference and links to 'high hedges' disputes and related legislation and processes would enhance the learner's understanding.

A learner working towards level 3 is likely to have experience of the management of trees with respect to good forestry and arboricultural practices. This unit aims to extend the learner's knowledge and skills involved with ensuring that any treework is undertaken within the requirements of appropriate legislation. It is important that the learner understands the practical implications of current legislation and Codes of Practice which may relate to treework and the need to maintain an awareness of legislation as it changes. In addition, relevant current and topical issues should be highlighted as and when they arise.

Centres are encouraged to introduce employers and specific professionals from the horticulture, forestry and arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of sites to add depth to the learner's experience.

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Quarterly Journal of Forestry

Unit 316 Understanding Principles of Forest Recreation

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the principles of forest recreation and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learner will develop an appreciation of the benefits to society of forest recreation provision and be able to evaluate the factors that influence this provision. The potential problems and constraints associated with multiple use management will be examined, as well as development considerations. The learner will also be able to plan and promote recreational activities and provision.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Understand forest recreation activities
2. Understand forest recreation planning, development and promotion
3. Be able to plan forest recreational activities.

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU22 Construct, maintain and repair boundaries and access points
CU23 Construct, maintain and repair paths and related structures
CU24 Install, maintain and repair site furniture and structures
CU96 Develop, negotiate and agree proposals to offer services and products

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 316 Understanding Principles of Forest Recreation
Outcome 1 Understand forest recreation activities

Assessment Criteria
The learner can:
1. Explain the **impact on society** of forest recreation provision
2. Evaluate forest **recreation activities**
3. Discuss **factors that influence** the use of forests for recreation
4. Discuss potential **problems and constraints** to forest recreation provision

Unit content

Impact on society
Social (recreation opportunities, ecological awareness, education), economic (for example local investment, employment, property values) environmental (for example correct management, increased planting)

Recreation activities
Walking, cycling, picnics, horse riding, nature watching, motor sports, sporting (game/wildlife activities), education, orienteering, archery, camping, fishing, guided tours, nature walks, nature talks, conservation work, short courses

Factors that influence
Local area, local population, facilities, access, maintenance, disposable income, promotion
Impact of ownership and management objectives on recreational potential

Problems and constraints
Land availability, land owners, health and safety, Local Planning Authority, normal site management, requirements of different users, access and parking, damage to forest areas, litter pollution, fire risk through public access

Unit 316 Understanding Principles of Forest Recreation
Outcome 2 Understand forest recreation planning, development and promotion

Assessment Criteria
The learner can:
1. Describe appropriate **design considerations** to promote the use of forests for recreation
2. Discuss the **physical** and **financial considerations** when planning forest recreation
3. Summarise current **legislation** relevant to forest recreation
4. Evaluate methods of **promoting** forest recreation.

Unit content

Design considerations
Current use, current facilities, current flora and fauna, effect on current management, likely demand, public access, local population, public consultation, environmental impact, increased public access, areas requiring special measures, dangerous areas

Physical considerations
Topography, soil type, water courses, wildlife, plants, crop species, crop age, crop density, current management plans, public roads, internal access, car parking

Financial considerations
Financial viability, investment, grants, income, costs

Legislation
Countryside and Rights of Way Act 2000, The Disability Discrimination Act 2005, Wildlife and Countryside Act 1981, Occupiers Liability Act 1984, The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, The Adventure Activities Licensing Regulations 2004, The Activity centres (Young Persons' Safety) Act 1995, Health and Safety at Work etc Act 1974, Health and Safety (First Aid) Regulations 1981, local planning authority

Promotion
Advertising, events (e.g. walks, competitions), sponsorship, schools, websites, media involvement, local engagement

Unit 316 Understanding Principles of Forest Recreation
Outcome 3 Be able to plan forest recreational activities

Assessment Criteria
The learner can:
1. Select appropriate forest **recreational activities** for a given situation
2. Prepare a **plan** to deliver forest recreational provision
3. Produce **promotional material** for forest recreational provision

Unit content

Recreational activities
Walking, cycling, picnics, horse riding, nature watching, education, orienteering, archery, camping, fishing, guided tours, nature walks, nature talks, conservation work, short courses

Planning
Aims, objectives, plans, future management, facility provision, structures, staffing, funding

Promotional material
Flyers, posters, leaflets, guides, presentations, website, artwork, interpretation board

Unit 316 Understanding Principles of Forest Recreation
Notes for guidance

This unit is designed to provide the learner with knowledge and skills required to prepare and plan forest recreational activities. Learners will develop an understanding of the methods of promoting and marketing recreational activities together with greater appreciation of the benefits that forest recreation can bring to society. The unit should cover a wide range of possible activities and potential sites.

Throughout the unit the emphasis should be on safe working and sustainability. It is expected that learners will be aware of safe working practices are familiar with accepted practices and behaviours within the context in which they are working. The importance of sustainable practices should be woven into the delivery throughout.

In Outcome 1, the leaner will be required to understand and evaluate the different activities available for forest recreation provision. This outcome will require some formal delivery but should also be delivered through site visits (e.g. to current forest recreation schemes) and learner research into schemes currently in operation locally, nationally and globally. Learners should develop an understanding of the impact forest recreation provision has on society and increase their appreciation of the factors that influence the use of schemes. Developing an understanding of the problems and constraints that may be faced when setting up forest recreation provision, will assist in achieving outcome 2.

Outcome 2 covers aspects relevant to preparing for the implementation of forest recreation activities. It is anticipated that the delivery of this unit will be through formal lectures and discussion, but it would be beneficial to have visiting expert speakers to add relevance to the subject particularly those that have been involved in planning and implementing recreation activities. Learners will develop their knowledge of legislation relevant to forest recreation and opportunities available for successful promotion of planned activities. An appreciation of financial viability of activities coupled with local and nationally available funding opportunities will also be required.

In Outcome 3, the learner will be able to put into practice knowledge gained from the other learning outcomes. This outcome will require some formal delivery but it is expected that most will be delivered through supervised classroom activities and directed work. Learners will assess sites for recreation opportunities, plan for their implementation and produce material that could be used to promote relevant activities.

This unit aims to extend the learners knowledge and skills involved with providing forest recreation. Emphasis should be placed upon the importance of planning and appreciating the needs and requirements of any potential users of the forest recreation provision. It is important that the learner understands current legislation and funding opportunities in relation to forest recreation provision.

Centres are encouraged to introduce employers and specific professionals from industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of establishments to add depth to the learner experience and put practices into context.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive lessons in a real environment. Learners must be given the opportunity to deal with a range of activities in different situations that reflect current industry trends.

References

Books

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Journals

Forestry and British Timber

Websites

www.forestry.gov.uk	The Forestry Commission
www.hse.gov.uk	The Health and Safety Executive

Unit 317 Understand the Principles of Silviculture

Level: 3

Credit value: 5

Unit aim

This unit aims to provide learners with an understanding of the principles of silviculture and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will understand common silvicultural systems, as well as silvicultural techniques and practices used to successfully establish and manage a woodland or forest for commercial gain. Methods commonly used to protect and improve established forests and woodlands will also be examined. The learner will also examine the harvesting systems associated with common silvicultural systems.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand common silvicultural systems
2. Understand the requirements for the successful establishment of forests or woodland
3. Understand how to protect and improve forest and woodland
4. Understand common harvesting systems

Guided learning hours

It is recommended that 30 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW3 Carry out site surveys and communicate on your findings
TW4 Clear sites for tree planting
TW5 Cultivate sites for tree planting
TW6 Plant and establish trees
TW7 Carry out post-planting protection and maintenance
TW8 Control unwanted vegetation around trees
TW21 Extract wood products using a horse
TW35 Dismantle trees from a MEWP

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 317 Understand the Principles of Silviculture
Outcome 1 Understand common silvicultural systems

Assessment Criteria
The learner can:
1. Evaluate **common silvicultural systems**

Unit content

Common silvicultural systems
Coppice, coppice with standards, clear-cutting system, selection system, group system, strip system, shelterwood system, agroforestry systems

Unit 317 Understand the Principles of Silviculture

Outcome 2 Understand the requirements for the successful establishment of forest and woodland

Assessment Criteria

The learner can:

1. Compare the requirements of **artificial and natural regeneration systems**

Unit content

Artificial and natural regeneration systems

High forest systems, even aged/uniform/regular, uneven aged/irregular, species mixtures, nurse crops, underplanting, direct seeding, coppice systems

Unit 317 Understand the Principles of Silviculture

Outcome 3 Understand how to protect and improve forest and woodland

Assessment Criteria

The learner can:

1. Explain **techniques and practices to protect forests and woodlands from fire**
2. Evaluate **techniques and practices to protect forest and woodlands from pests and pathogens**
3. Evaluate **techniques and practices to protect forests and woodlands from weeds**
4. Evaluate the **management objectives and maintenance practices** associated with individual silvicultural systems

Unit content

Techniques and practices to protect forest and woodlands from fire

Causes of fire, ignition sources, danger periods, types of fire (ground, surface, crown), fire behaviour, impact upon crop, financial implications, insurance
Fire prevention: ride layout, removal of combustible material
Fire fighting: communication systems, water supplies, emergency services, provision and location of equipment

Techniques and practices to protect forest and woodlands from pest and pathogens

Pests and pathogens (bacteria, fungi, vertebrate pests (rabbits, deer, squirrels, humans), invertebrate pests), impact upon crop, financial implications
Surveys: faeces, damage, timing, distribution and frequency, decay detection equipment
Trapping: approved traps, use of pheromones, pesticides and repellents
Physical barriers: fencing, tree shelters, guards
Breeding for natural resistance, species selection, plant passports and import legislation, biological control (predators and parasites), shooting and culling, pruning and sanitation felling

Techniques and practices to protect forest and woodlands from weeds

Impact upon crop, financial implications
Competing vegetation: woody vegetation, herbaceous vegetation, grass
Control methods: approved herbicides, mulching, tree shelters, manual, motor-manual, mechanised

Management objectives and maintenance practices

Objectives: improved timber qualities, access, improve form, increase visibility, minimise windthrow risk, manage competition, weed control, optimum stocking density, financial considerations
Re-spacing: methods (manual, motor-manual, mechanised), timing (eg crown closure)
Thinning: thinning methods (manual, motor-manual, mechanised), thinning intensity, thinning cycles, timing, thinning regime (systematic, selective), thinning yield, residual stand characteristics
Brashing and pruning: types (formative pruning, high pruning), residual stand characteristics, timing
Climate change

Unit 317 Understand the Principles of Silviculture
Outcome 4 Understand common harvesting systems

Assessment Criteria
The learner can:
1. Examine **harvesting activities** associated with common silvicultural systems

Unit content

Harvesting activities
Harvesting systems (tree length system, shortwood system, whole tree system), felling and delimbing methods (manual, motor-manual, mechanised), extraction to roadside (skidder, forwarder, cable crane, horse), transport to market, road systems (planning, design, construction, intensity), terrain classification, windthrow risk, machinery optimisation, crop characteristics, market requirements

Unit 317 Understand the Principles of Silviculture
Notes for guidance

This unit is designed to provide the learner with the knowledge of the principles of silviculture associated with the successful raising, tending and harvesting of forest crops. The unit should cover as wide a range of common operations as possible to enable the learner to adapt and apply their knowledge to the range of forest and woodland types they may encounter and focus on methods locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working and good environmental practices. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a not requirement for learners to operate or use equipment. However, if the learner is given the opportunity to undertake practical silvicultural techniques and practices, health and safety issues relevant to any equipment used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the equipment and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is not a requirement for the learner to use pesticides or other approved chemical or trapping methods. Simulation and demonstration should be used to illustrate appropriate methods and equipment, particularly those commonly used, but unavailable to the learner.

In Outcome 1, the learner will be required to understand common silvicultural systems. It is accepted that this outcome will require formal delivery but it should be primarily delivered in practical situations. It would be beneficial to include learning within the wider context of silvicultural systems. For example, reference and links to non-timber management aims and objectives would enhance the learner's experience. In addition, current and topical issues should be highlighted as and when they arise.

In Outcome 2, the learner will understand the requirements for the successful establishment of forests or woodland. It is anticipated that the delivery of this outcome will require some formal delivery but it should be primarily delivered in practical situations. It would be beneficial to include learning within the wider context of forestry establishment. Reference and links to common nursery practices would enhance the learner's experience. In addition, current and topical issues should be highlighted when they arise.

In Outcome 3, the learner will understand how to protect and improve forests and woodlands. It is anticipated that the delivery of this outcome will require some formal sessions but it should be primarily delivered in practical situations. The learner should be able to experience as wide a range of real examples of techniques and methods as possible; this may vary according to the forest sites available.

In Outcome 4, the learner will understand common forest harvesting systems. It is anticipated that the delivery of this outcome will require some formal sessions but it should be primarily delivered in practical situations. The learner should be able to experience as wide a range of real examples of systems and methods as possible; this may vary according to the forest sites available.

A learner working towards level 3 is likely to have experience of practical forestry activities. This unit aims to extend the learner's knowledge and skills involved with the practical establishment and maintenance of healthy forests and woodlands. Emphasis should be placed upon the importance of long term planning and strategies to ensure safe, efficient, effective and successful implementation of tree management systems. It is important that the learner understands the importance of maintaining

awareness and understanding of current legislation and Codes of Practice in relation to forest and woodland management.

Centres are encouraged to introduce employers and specific professionals from the forestry industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner experience by studying management systems and machinery in operation. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of forest and woodland work and the impact of extreme weather conditions on operations.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to examine a wide range of harvesting and extraction equipment and machinery in different forest and woodland situations which reflects current industry practice. It is anticipated that the range of machinery may include that adapted from the construction or agricultural industries as well as purpose built equipment.

References

Books

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Journals

Forestry and British Timber

Quarterly Journal of Forestry

Unit 318 Understand the Principles of Tree Science

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of tree science and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will develop an understanding of the impact of environmental conditions upon trees. In addition, the learner will understand tree structural growth processes and how decay and wounding can impact upon trees and their management.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand how trees respond to changes in environmental conditions
2. Understand ill health and decay processes in trees
3. Understand wound response in trees
4. Understand tree biomechanics and structural assessment

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU 80 Plan and manage the control of pests, diseases and disorders

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 318 Understand the Principles of Tree Science

Outcome 1 Understand how trees respond to changes in environmental conditions

Assessment Criteria

The learner can:

1. Describe how trees **adapt their growth and development** to their environmental conditions
2. Explain how **selected environmental conditions** can be altered to influence tree growth
3. Explain how environmental conditions can **increase susceptibility** of trees to decay and mechanical failure

Unit content

Adapt their growth and development

Chronic and acute effects, leaf structure and photosynthesis, energy storage and use, apical control and dominance, primary and secondary growth, respiration, crown and root development, osmosis and water movement, seed production, dormancy, germination, branching habit, crown shape and size, stem form, taper and buttress development, growth rates, survival, meteorological conditions (temperature, wind, precipitation, humidity), pollution, site conditions (soil aeration, exposure, pesticides, nutrient deficiencies)

Selected environmental conditions

Soil pH, soil moisture, soil aeration

Increase susceptibility

Stress (limited light availability, poor soil aeration and moisture availability), wind and snow loading, removal of support

Unit 318 Understand the Principles of Tree Science
Outcome 2 Understand ill health and decay processes in trees

Assessment Criteria
The learner can:
1. Describe **potential causes of ill health in trees**
2. Explain how **decay** processes influence structural strength of trees
3. Explain how **decay detection** can be used to assess potential tree failure
4. Outline potential **actions to manage decay** in trees

Unit content

Potential causes of ill health in trees
Decay processes influence structural strength
Brown rots, white rots, soft rots, degradation of cell wall structure and components

Decay detection
Invasive and non-invasive methods

Actions to manage decay
Warning signs, physical barriers, pruning and felling, restraint and support systems

Unit 318 Understand the Principles of Tree Science
Outcome 3 Understand wound response in trees

Assessment Criteria
The learner can:
1. Identify **anatomical features** in wood
2. Explain **growth and defence processes** in trees in response to wounding and decay
3. Explain how **current pruning conventions** relate to wound response in trees

Unit content

Anatomical features
Xylem and phloem, rays tracheids, fibre tracheids, vessels, parenchyma, rays, earlywood and latewood, diffuse porous and ring porous

Growth and defence processes
Storage and mobilisation of energy reserves, impact of age of tree, physical defences (thorns, bark, leaf adaptations etc.), chemical defences (resins, gums, tannins etc.), Compartmentalization of Decay in Trees (CODIT), wound and callus growth

Current pruning conventions
Pruning concepts in relation to energy use, wound closure, timing of operations, natural target pruning, branch collars, branch bark ridge, appropriate tools and equipment, British Standard 3998

Unit 318 Understand the Principles of Tree Science

Outcome 4 Understand tree biomechanics and structural assessment

Assessment Criteria

The learner can:

1. Explain current **biomechanical theories** explaining mechanical strength and integrity of trees
2. Evaluate how trees are **assessed for potential mechanical failure**
3. Outline the **implications of mechanical failure** for tree management
4. Describe how weak tree structures can be **appropriately supported**

Unit content

Biomechanical theories

Current theories (axiom of uniform stress, undamaged tree as a self optimised structure, principle of the minimum lever arm)

Assessed for potential mechanical failure

Invasive and non-invasive methods, visual inspection, Visual Tree Assessment (VTA), recognition of defects, sounding, fractometer, resistograph, electrical resistance, tree pulling

Implications of mechanical failure

Insurance claims, reputation and public relations, legal claims and prosecution, remedial action.
Health and Safety at Work etc Act 1974
Occupiers' Liability Act 1957 (as amended 1984)

Appropriately supported

Invasive and non-invasive methods, cable bracing, flexible bracing, rod bracing, propping, guying

Unit 318 Understand the Principles of Tree Science
Notes for guidance

This unit is designed to provide the learner with the sound knowledge of tree structure, how trees grow and adapt to their environment and ultimately respond to wounding, ill-health and decay. The content and context of the unit should be adapted where possible to the learner's area of study. The unit should cover a range of decay fungi as appropriate to the area of study as well as those locally or regionally significant to the learner.

It is anticipated that the delivery of this unit may initially focus mainly upon formal lectures but it is recommended that as far as is possible, they are linked directly with interactive lessons in a real environment. Where practical learning is undertaken, the emphasis should be on safe working. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. Simulation and demonstration could be used to illustrate appropriate equipment and techniques, such as decay detection, which are commonly used, but unavailable to the learner.

In Outcome 1, the learner will be required to understand how trees respond to environmental conditions. It is accepted that this outcome will require formal delivery but it should also be delivered in practical situations where the learner is able to see how different environmental conditions influence tree growth and development. The learner should be encouraged to assess a range of tree appropriate to their area of study.

In Outcome 2 the learner will be required to understand ill-health and decay processes in trees. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations appropriate to the area of study. It is expected that the learner will be given the opportunity to study decay fungi throughout the year, with regard to when signs and symptoms may be most easily found.

In Outcome 3, the learner will be required to understand how trees respond to wounding. It is anticipated that the delivery of this outcome will require some formal sessions, but it should be delivered in practical situations and appropriate to the area of study. It would be beneficial to include learning within the wider context of tree pruning. For example, reference and links to how different tree species respond to pruning would enhance the learner's understanding.

In Outcome 4, the learner will be able to understand biomechanical theories explaining tree structure and structural assessments. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study. Although not essential, it would be beneficial to allow the learner to erect structural support and undertake structural assessments of trees to enhance their understanding.

A learner working towards level 3 is likely to have experience of the promotion of the healthy establishment and growth of trees. This unit aims to extend the learner's knowledge and skills involved with ensuring the long term health and management of trees. Emphasis should be placed on the importance of planning and strategies to promote tree health within their charge and the practical application of current theories. It is important that the learner understands current legislation and Codes of Practice which may relate to tree health management. In addition, relevant current and topical issues should be highlighted as and when they arise.

Centres are encouraged to introduce employers and specific professionals from the horticulture, forestry and arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of establishments to add depth to the learner's experience.

References

Books

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Journals

Arboricultural Advisory Information Service publications

Arboricultural Association newsletter

Forestry and British Timber

Journal of Arboriculture

Quarterly Journal of Forestry

Unit 319 Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of specialist forestry and arboricultural machinery and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will develop an understanding of the importance of specialised forestry or arboricultural machinery and the significance within the industries. They will be able to maintain and operate specialist forestry or arboricultural machinery to meet given objectives. The learner will also be able to explain the operating principles of machinery and how the machinery has developed to meet industry requirements.

Learning outcomes

There are three learning outcomes to this unit. The learner will:

1. Understand the importance of specialised machinery for forestry or arboriculture
2. Be able to maintain specialised forestry or arboricultural machinery
3. Be able to operate specialised forestry or arboricultural machinery

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW15 Fell trees mechanically
TW16 Process trees mechanically
TW17 Extract wood products by forwarder
TW18 Extract wood products by skidder
TW19 Extract wood products by cable crane
TW23 Extract wood products using small motorised equipment

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 319 Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery

Outcome 1 Understand the importance of specialised machinery for forestry or arboriculture

Assessment Criteria

The learner can:

1. Evaluate the **range of specialist machinery** for forestry or arboricultural applications
2. Explain the **criteria for selecting** appropriate machinery to undertake forestry or arboricultural tasks
3. Explain the **importance of specialist forestry or arboricultural machinery to the industries**
4. Explain the **need to keep accurate and up-to-date records**

Unit content

Range of specialist machinery
Mounted, self-propelled and pedestrian operated machinery
Forestry: land clearance and preparation (excavators, scarifiers, mulchers, ditchers, planters), felling (chainsaws, winches, harvesters), forwarding (line skidders, grapple skidders, clambunk skidders, forwarders, cable cranes), processing (stroke and bed processors, peelerpointers, sawbenches) waste removal (brushwood chippers)
Arboricultural: land clearance and preparation, waste removal (stump grinders, brushwood chippers), planting (tree spades, planters), felling (chainsaws, polesaws, winches), tree removal (mobile elevating work platforms, lowering equipment, cranes)

Criteria for selecting
Suitability for purpose, effectiveness, rate of work, operator training and experience, legal implications, maintenance and servicing (spares availability, dealer support), financial implications (purchase cost, leasing, insurance, servicing and parts, depreciation), compatibility with other machinery

Importance of specialist forestry or arboricultural machinery to the industries
Reduced labour cost, improved economic efficiency, engineering control as part of a risk assessment

Need to keep accurate and up-to-date records
Requirement under current legislation, stock records, machinery service intervals, insurance requirements, business analysis

Unit 319 Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery

Outcome 2 Be able to maintain specialised forestry or arboricultural machinery

Assessment Criteria

The learner can:

1. Describe the **importance of routine and non-routine maintenance**
2. Identify **common faults and suggest appropriate rectification measures**
3. Carry out **routine servicing and maintenance**

Unit content

Importance of routine and non-routine maintenance
Recognition of incorrect operation, legal requirement, maintain efficient operation, reduce breakdowns, cost implications, guarding.

Common faults and suggest appropriate rectification measures
Common faults appropriate to the equipment: incorrect, polluted or lack of fuel, blocked filters, poor oil pressure, damaged sprockets and fouled drive systems, damaged or dull cutters, fouled spark plugs, bad earth connection, blocked mechanisms
Rectification measures as per manufacturers' or suppliers' guidance and operator's manual
Pre-start checks, routine maintenance, service intervals, logging hours of use, cleaning and inspection after use
Use of manufacturers' part numbers

Routine servicing and maintenance
Replacement and adjustment of operator serviceable components as per manufacturers' or suppliers' guidance and operator's manual
Blades, anvils, cutting teeth, bearings, tyres, filters, greasing, traction aids

Unit 319 Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery

Outcome 3 Be able to operate specialised forestry or arboricultural machinery

Assessment Criteria

The learner can:

1. Describe the significance of **current relevant legislation and industry guidance** for forestry or arboricultural machinery operation
2. Explain how to **minimise possible environmental impacts** of using specialist forestry or arboricultural machinery
3. Carry out **risk assessments**
4. Carry out **pre-start checks and adjustments** as per manufacturers' recommendations
5. **Operate** specialised forestry or arboricultural machinery safely and effectively to meet given objectives

Unit content

Current relevant legislation and industry guidance

Provision and Use of Work Equipment Regulations 1998 (PUWER), Lifting Operations and Lifting Equipment Regulations 1998 (LOLER), Health and Safety at Work Act 1974, Management of Health and Safety at Work Regulations 1999, Control of Substances Hazardous to Health Regulations 2002 (COSHH), Manual Handling Operations Regulations 1992, Personal Protective Equipment (PPE) at Work Regulations 1992, Environmental Protection Act 1990, Wildlife and Countryside Act 1981
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides
Health and Safety Executive Information Sheets
CE markings, Warning symbols, risk assessment, operator training, Personal Protective Equipment (PPE), safety devices, pre-start checks.

Minimise possible environmental impacts

Awareness of requirements under control of pollution legislation, oil and fuel spillage and storage, soil stability and erosion, nesting and breeding seasons, protected species, waste disposal, watercourses, archaeology, brash matting

Risk assessments

Identification of appropriate hazards and risks (to include, site, weather conditions, operator, machine and task), risk control and reduction (establishment of safety zones) emergency procedures, public access and rights of way/highways, power lines and underground services, noise levels, machine stability, moving parts, warning signs and barriers, flying debris

Pre-start checks and adjustments

In accordance with manufacturers' guidance and operator's manual

Operate

Adherence to industry safety guidance and operator's manual, safe start and stop, monitoring or machine performance and output, effective communications, awareness of hazards, clearance of blockages, awareness of public and work colleagues, conversion between work and transport positions, economic operation, adherence to specifications, use of traction aids, safe and efficient operation, importance of routine and non-routine maintenance cleaning and inspection of machine for defects

Unit 319 Operate, Maintain and Understand the Principles of Specialist Forestry and Arboricultural Machinery

Notes for guidance

This unit is designed to provide the learner with the knowledge of the diversity and range of machinery available and the skills required to maintain and operate specialised machinery appropriate to the area of study. The unit should cover as wide a range of machinery as possible, appropriate to the area of study as well as those locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for the learner to operate machinery therefore health and safety issues relevant to the machinery used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual.

In Outcome 1, the learner will be required to understand the range and importance of specialised machinery appropriate to their area of study. It is accepted that this outcome will require formal delivery but it could also be delivered in practical situations such as trade shows where the learner is able to view and compare a range of machinery. The learner should be encouraged to obtain and review manufacturers' information.

In Outcome 2 the learner will be required to maintain and service specialised machinery appropriate to their area of study. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations appropriate to the area of study. It is expected that the learner will be given access to appropriate workshop facilities and tools to maintain and service the machinery. It is essential that the manufacturers' manuals are available to undertake this work. As a minimum, it is expected that the learner will be able to service and maintain three specialist machines appropriate to their area of study in a realistic industrial environment where possible.

In Outcome 3, the learner will be required to operate specialised machinery appropriate to their area of study. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments. As a minimum, it is expected that the learner will be able to operate three specialist machines appropriate to their area of study in a realistic industrial environment where possible. The learner should be given appropriate time in order to develop operational skills before assessment. The learner is not required to transport machinery, but should be aware of transport requirements

Centres are encouraged to introduce employers and specific professionals from the forestry or arboriculture industry, such as specialised machinery suppliers and dealers, or machinery operators to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner experience by studying machinery in operation.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to work with a range of machinery in different situations which reflects current

industry practice. It is anticipated that the range of machinery may include equipment adapted from the construction or agricultural industries as well as purpose built equipment.

References

Books

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Journals

Arboricultural Association newsletter

Forestry and British Timber

Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Unit 320 Maintain and Understand Equipment used for Timber Conversion and Utilisation

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of timber conversion and utilisation and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will be able to maintain and safely operate timber conversion and processing equipment to produce timber products. The range of conversion and processing equipment will be examined. In addition, the criteria used to select appropriate equipment to produce specific products will be examined. The learner will also evaluate how timber products are marketed and the factors that influence timber product utilisation and the need for timber preservation.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand conversion and processing equipment
2. Be able to maintain timber conversion and processing equipment
3. Be able to operate timber conversion and processing equipment and produce marketable products
4. Understand timber utilisation and the preservation process

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW24 Process timber on site

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 320 Maintain and Understand Equipment used for Timber Conversion and Utilisation

Outcome 1 Understand conversion and processing equipment

Assessment Criteria

The learner can:

1. Evaluate the **range of equipment** to convert and process round timber into final products
2. Explain the **criteria for selecting** appropriate equipment to produce specific products

Unit content

Range of equipment

Mounted, self-propelled and pedestrian operated machinery
Chainsaws, firewood processors, debarkers, charcoal kilns, log splitters, peeler pointers, circular saw benches, chainsaw mills, sawmills, brushwood chippers

Criteria for selecting

Suitability for purpose, effectiveness, rate of work, operator training and experience, legal implications, maintenance and servicing (spares availability, dealer support), financial implications (purchase cost, leasing, insurance, servicing and parts, depreciation), compatibility with other machinery

Unit 320 Maintain and Understand Equipment used for Timber Conversion and Utilisation

Outcome 2 Be able to maintain timber conversion and processing equipment

Assessment Criteria

The learner can:

1. Describe the **importance of routine and non-routine maintenance**
2. Identify **common machinery faults and suggest rectification measures**
3. Carry out **routine machinery maintenance**

Range

Chainsaws, firewood processors, debarkers, charcoal kilns, log splitters, peelerpointers, circular sawbenches, chainsaw mills, sawmills, brushwood chippers

Unit content

Importance of routine and non-routine maintenance
Recognition of incorrect operation, legal requirement, maintain efficient operation, reduce breakdowns, cost implications, guarding, impact of poor machinery maintenance and operation on product quality

Common machinery faults and suggest rectification measures
Faults appropriate to the equipment: incorrect, polluted or lack of fuel, blocked filters, poor oil pressure, damaged sprockets and fouled drive systems, damaged or dull cutters, fouled spark plugs, bad earth connection, blocked mechanisms
Rectification measures as per manufacturers' or suppliers' guidance and operator's manual
Pre-start checks, routine maintenance, service intervals, logging hours of use, cleaning and inspection after use

Routine machinery maintenance
Replacement and adjustment of operator serviceable components as per manufacturers' or suppliers' guidance and operator's manual- blades, anvils, cutting teeth, bearings, tyres, filters, greasing, traction aids

Unit 320 Maintain and Understand Equipment used for Timber Conversion and Utilisation

Outcome 3 Be able to operate timber conversion and processing equipment and produce marketable products

Assessment Criteria

The learner can:

1. Describe the significance of **current relevant legislation and industry guidance**
2. Carry out **risk assessments** and **pre-start checks and adjustments** as per manufacturers' recommendations
3. **Safely convert and stack wood produce** to given specifications
4. **Safely operate processing equipment** to produce timber products to given specifications

Range

Chainsaws, firewood processors, debarkers, charcoal kilns, log splitters, peeler pointers, circular saw benches, chainsaw mills, sawmills, brushwood chippers

Unit content

Current relevant legislation and industry guidance

Provision and Use of Work Equipment Regulations 1998 (PUWER), Lifting Operations and Lifting Equipment Regulations 1998 (LOLER), Health and Safety at Work Act 1974, Management of Health and Safety at Work Regulations 1999, Control of Substances Hazardous to Health Regulations 2002 (COSHH), Manual Handling Operations Regulations 1992, Personal Protective Equipment (PPE) at Work Regulations 1992, Environmental Protection Act 1990
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides
Health and Safety Executive Information Sheets
Warning symbols, risk assessment, operator training, Personal Protective Equipment (PPE), safety devices, pre-start checks, oil and fuel spillage and storage, environmental protection, waste disposal

Risk assessments

Identification of appropriate hazards and risks (to include, site, weather conditions, operator, machine and task), risk control and reduction (establishment of safety zones) emergency procedures, public access and rights of way/highways, power lines and underground services, noise levels, machine stability, moving parts, warning signs and barriers, flying debris

Pre-start checks and adjustments

In accordance with manufacturers' guidance and operator's manual

Safely convert and stack wood produce

Cross-cut timber at conversion point to meet specifications, safely stack in preparation for processing, ensure timber stack is stable

Safely operate processing equipment

Adherence to industry safety guidance and operator's manual, safe start and stop, monitoring or machine performance and output, effective communications, awareness of hazards, clearance of blockages, awareness of public and work colleagues, conversion between work and transport positions,

economic operation, adherence to specifications, use of traction aids, safe and efficient operation, importance of routine and non-routine maintenance cleaning and inspection of equipment for defects

Unit 320 Maintain and Understand Equipment used for Timber Conversion and Utilisation

Outcome 4 Understand timber utilisation and the preservation process

Assessment Criteria

The learner can:

1. Evaluate the **factors** that influence timber product utilisation
2. Explain commonly used **timber preservation types and processes**
3. Evaluate **how timber products are marketed**

Unit content

Factors

Wood characteristics: natural durability, sapwood/heartwood ratio, ease of preservative penetration, acoustic properties, dimensional stability, strength, proportion of knots, chemical composition, cutting pattern (quarter, radial or plain sawn)
Economic considerations: market characteristics and demand, transport to buyer, current prices, competition

Timber preservation types and processes

Types: organic solvent, water borne, creosote)
Processes: brushing, immersion, spraying, full cell process, empty cell process, double vacuum process
Exposure hazard classes

How timber products are marketed

Marketing media: internet marketing, local and national press, specialist press
Sale methods: direct sales, auction, tender
Unique selling points, pricing strategy, target customers

Unit 320 Maintain and Understand Equipment used for Timber Conversion and Utilisation

Notes for guidance

This unit is designed to provide the learner with the knowledge and skills associated with the conversion and processing of timber and knowledge of how timber products are marketed and subsequently utilised. The unit should cover as wide a range of processing and conversion machinery as possible, with an emphasis upon those locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for the learner to operate machinery therefore health and safety issues relevant to the machinery used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual.

In Outcome 1, the learner will be required to understand the range of conversion and processing equipment. It is accepted that this outcome will require formal delivery but it could also be delivered in practical situations such as trade shows where learners are able to view and compare a range of machinery. The learner should be encouraged to obtain and review manufacturers' information.

In Outcome 2, the learner will be required to maintain and service processing and conversion equipment. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be primarily delivered in appropriate practical situations. It is expected that the learner will be given access to appropriate workshop facilities and tools to maintain and service the machinery. It is essential that the manufacturers' manuals are available to undertake this work. As a minimum, it is expected that the learner will be able to service and maintain three different types of machines appropriate to their area of study in a realistic industrial environment where possible. Learners should be aware of the impact of poor machinery maintenance and operation on product quality.

In Outcome 3, the learner will be required to safely operate processing and conversion equipment and produce marketable products. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments. As a minimum, it is expected that the learner will be able to operate three different types of machines to produce three different products in a realistic industrial environment where possible. The learner should be given appropriate time to develop operational skills before assessment. The learner is not required to transport machinery, but should be aware of transport requirements. The resulting products must meet the set specifications (size, quality, uniformity) established for the products to be subsequently marketed.

In Outcome 4, the learner will be able to understand the factors that impact upon timber utilisation and how timber products can be effectively marketed. Emphasis should be placed on current preservation technology and approved pesticides, and it is essential to include new marketing innovations and developments as they arise in the marketplace.

A learner working towards level 3 is likely to have experience of the promotion of machinery operation and tree structure and biology. This unit aims to extend the learners knowledge and skills associated with the 'downstream' processing industries and factors that influence how timber is used by society.

Emphasis should be placed not only on 'doing', but also upon the importance of understanding the product characteristics required within the marketplace. It is important that the learner understands the importance of maintain an awareness of current legislation and Codes of Practice in relation to equipment operation.

Centres are encouraged to introduce employers and specific professionals from the forestry or arboriculture industry, such as specialised machinery suppliers and dealers, or machinery operators to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner's experience by studying machinery in operation.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to work with a range of conversion and processing equipment in different situations which reflects current industry practice. It is anticipated that the range of machinery may include equipment adapted from the construction or agricultural industries as well as purpose built equipment.

References

Books

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Journals

Forestry and British Timber

Timber Trades Journal

Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Unit 321 Understand and Plan Urban and Community Forestry Projects

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of urban and community forestry projects and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will develop an appreciation of the history and significance of urban forestry and the issues relating to managing public access in urban and community forestry projects. Methods commonly used to promote public engagement and participation, as well as the significance of stakeholder consultation will also be examined. The learner will be able to produce specifications for an urban or community forestry project that includes the involvement of the local community.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand the importance of urban and community forestry projects
2. Understand urban and community forestry management issues
3. Understand public involvement in urban and community forestry projects
4. Be able to plan urban and community forestry projects

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU92 Determine policies for the development of land-based sites

CU99 Assess, negotiate and secure sources of funding

CU142 Organise a straight-forward land-based project or event

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 321 Understand and Plan Urban and Community Forestry Projects

Outcome 1 Understand the importance of urban and community forestry projects

Assessment Criteria

The learner can:

1. Review the **history of urban and community forestry**
2. Evaluate the **benefits to society** of urban and community forestry

Unit content

History of urban and community forestry

National Parks and Access to the Countryside Act 1949, Countryside Acts 1967 and 1968
Town and Country Planning Act 1990
New towns, development of town and country planning legislation, development of countryside access, historical role of National Urban Forestry Unit, country parks, national parks, community forestry initiatives, National Forest, Tree Council's tree warden scheme, Agenda 21, role of governmental e.g. Local Planning Authorities and Forestry Commission and Non-Governmental Organisations e.g. Tree Council

Benefits to society

Example benefits include: reduced pollution, improved air quality, increased employment prospects, increased visitors, increased property values, increased access to the countryside, healthier lifestyles, reduced energy consumption, financial benefits, regeneration of derelict and industrial land, improved landscapes, increased wildlife habitat and diversity

Unit 321 Understand and Plan Urban and Community Forestry Projects

Outcome 2 Understand urban and community forestry management issues

Assessment Criteria

The learner can:

1. Evaluate the **types of public access**
2. Explain the **legal implications** of public access and participation
3. Evaluate ways in which the **public influence management objectives**
4. Compare the **management of urban trees with the management of forest trees**
5. Review **potential sources of funding and support** for urban and community forestry projects

Unit content

Types of public access
Legal mechanisms to access land: Countryside and Rights of Way Act 2000, agri-environment schemes, common land, customary access, dedicated land, public right of way, permissive access
Illegal access to land: trespass, criminal trespass, aggravated trespass

Legal implications
Health and Safety at Work Act 1974, Occupiers' Liability Act 1957, Occupiers' Liability Act 1984, Countryside and Rights of Way Act 2000, Disability Discrimination Act 1995,
Management of Health and Safety at Work Regulations 1999

Public influence management objectives
Safety implications, media and public pressure, vandalism, restoration of sites, recreation, local concerns

Management of urban trees with the management of forest trees
Scale of management, public visibility, number and range of tree species, access arrangements and facilities, land value, staffing, logistical considerations, individual tree value
Urban trees: amenity value, diverse range of species, vandalism, proximity to buildings, Forest trees: timber value, limited range of species, commercial activities, wind and fire damage, silvicultural systems

Potential sources of funding and support
Commercial loans, sponsorship, grants

Unit 321 Understand and Plan Urban and Community Forestry Projects

Outcome 3 Understand public involvement in urban and community forestry projects

Assessment Criteria

The learner can:

1. Explain the **importance and need for consultation and communication** with key stakeholders
2. Examine **how the public can participate** in urban and community forestry projects
3. Examine **opportunities and constraints** to wider public engagement and participation
4. Assess **resources required** to engage with the wider public

Unit content

Importance and need for consultation and communication

Financial (grants, loans and sponsorship), public relations, legal requirement

How the public can participate

Voluntary participation, individual participation, community participation, residents' and tenants' associations, church groups, schools, conservation groups, local businesses, landowners, youth organisations

Opportunities and constraints

Apathy, lack of awareness and information, local considerations, resources (finance, labour, equipment), social networks, historical experience, legal constraints, public safety, local custom and practice

Resources required

Venues, facilities, sites, finance, equipment, publications, marketing, labour, training and education

Unit 321 Understand and Plan Urban and Community Forestry Projects

Outcome 4 Be able to plan urban and community forestry projects

Assessment Criteria

The learner can:

1. Explore **options for public participation**
2. Produce **specifications** for local community involvement in an urban or community forestry project

Unit content

Options for public participation

Meet with church clergy, schools, office blocks, residence

Specifications

Site selection, appropriate objectives, site design, management plan, mechanisms to communicate with key stakeholders, opportunities for public participation, marketing requirements and resources required

Unit 321 Understand and Plan Urban and Community Forestry Projects

Notes for guidance

This unit is designed to provide the learner with the knowledge and skills required to understand the history and development of urban and community forestry projects, as well as their current significance and importance to society. The unit should cover a range of urban and community forestry projects, using real case studies, especially those which are locally or regionally significant to the learner.

It is anticipated that the delivery of this unit may initially focus mainly upon formal lectures but it is recommended that as far as is possible, they are linked directly with interactive lessons in a real environment. Where practical learning is undertaken, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working.

In Outcome 1, the learner will be required to understand the importance of urban and community forestry projects. It is accepted that this outcome will require formal delivery but it should also be delivered in practical situations where the learner is able to experience existing projects at various stages of development.

In Outcome 2 the learner will be required to understand the management issues associated with urban and community forestry projects. It is anticipated that the delivery of this unit will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study. It is expected that the learner will be given the opportunity to meet with individuals responsible for managing existing urban forestry projects, as well as those responsible for managing traditional forestry enterprises.

In Outcome 3, the learner will be required to understand public involvement in urban and community forestry projects. It is anticipated that the delivery of this unit will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study. It is expected that the learner will be given the opportunity to meet with stakeholders involved in existing or proposed projects.

In Outcome 4, the learner will be able to plan urban and community forestry projects. Learners should ideally become involved in an existing or proposed project, or an appropriate site selected and the learner provided with a detailed scenario to base their plan upon if this is not possible.

A learner working towards level 3 is likely to have experience of the promotion of the establishment and growth of trees. This unit aims to extend the learners knowledge and skills involved with ensuring the successful management of trees within an urban context. Emphasis should be placed not only on 'doing', but also upon the importance of planning and strategies to promote tree health within their charge. It is important that the learner understands the importance of maintaining an awareness of current issues such as legislation and funding in relation to urban and community forestry.

Centres are encouraged to introduce employers and specific professionals from the urban forestry and arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of urban green space to compare urban and traditional forestry management to add depth to the learner experience and illustrate the benefits of trees in urban

settings, as well as the range and diversity of management issues, such as vandalism and public safety. Current and topical issues reported in the media should be highlighted as and when they arise.

References

Books

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Bending N.A.D. 1997. *Tree Establishment on Landfill Sites: Research and Updated Guidance*. Edinburgh: Forestry Commission. ISBN 0855383518.

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Trowbridge, P.J., Bassuk, N.L. 2004. *Trees in the Urban Landscape: Site Assesment, Design, and Installation.* Sussex: Wiley Publishing. ISBN 0471392464.

Watkins, J., Wright, T. 2007. *The Management and Maintenance of Historic Parks, Gardens and Landscapes: The English Heritage Handbook.* London: Francis Lincoln. ISBN 0711224390.

Journals

Arboricultural Association newsletter
Forestry and British Timber
Horticulture Week
Journal of Arboriculture
Quarterly Journal of Forestry
Tree News
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Unit 322 Manage Heritage Gardens and Arboreta

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of how to manage heritage gardens and arboreta and how this can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learner will understand the reasons for the development of arboretum or a heritage garden. The learner will collect and collate data relating to an arboretum or heritage garden. The promotion of an arboretum or heritage garden will be fully investigated. Learners will develop a detailed management plan for an arboretum or a heritage garden.

Learning outcomes

There are four learning outcomes to this unit. The learner will be able to:

1. Understand the development of arboreta or heritage gardens
2. Be able to collect and collate data relating to an arboretum or heritage garden
3. Be able to promote arboreta or heritage gardens
4. Be able to plan the management of an arboretum or heritage garden

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

N/A

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 322 Manage Heritage Gardens and Arboreta

Outcome 1 Understand the development of arboreta or heritage gardens

Assessment Criteria

The learner can:

1. Summarise the **development of arboreta or heritage gardens** including origins, organisations
2. Review and discuss the **trends in public usage**
3. Evaluate the **benefits and liabilities of public access** to arboreta or heritage gardens.
4. Describe the **salient features** of an arboretum or heritage garden with public access, including **plant collections, internal sources of income, access and transport, visitor facilities.**

Unit Content

Development of arboreta or heritage gardens

Soil and site considerations, historic criteria for development of Heritage Gardens, conservation issues for development, education and research criteria, data collection to include risk assessments

Trends in public usage

Age group of visitors using the facilities, educational use of the facilities

Benefits and liabilities of public access

Revenue from entrance fees and supplementary commercial outlets, health and safety legislation with public access, facility requirement for public access

Salient features

Design of arboretum/heritage garden, sources of income, provision of car parks and visitor facilities

Plant Collections

Identification and display of plants, educational information on plants/plant groups, plants for different soil types, pH and climate

Internal sources of income, access and transport and visitor facilities.

Local and national grants, government funding, commercial income

Unit 322 Manage Heritage Gardens and Arboreta

Outcome 2 Be able to collect and collate data relating to an arboretum or heritage garden

Assessment Criteria

The learner can:

1. Collect and collate **data for a given area of an arboretum or garden** including access, perimeters, biological factors, soil type, aspect, current sources of income
2. Collect and collate **data for specific plants or trees**, including species, number, height, spread, form
3. **Access relevant data** from maps, websites, government departments, local weather data, previous management plans
4. **Explain how data collected can be used** to develop the arboretum or garden

Unit content

Data for a given area of arboreta or heritage garden

Access arrangement for public, soil texture/structure pH, soil profile analysis

Data for specific plants or trees

Plant populations, height, spread, form, evergreen/deciduous and pH preference

Access relevant data

Planning office of local authority, Government organisations, historic references for heritage gardens to include public and private reference collections e.g. (Royal Horticultural Society (RHS)

Explain how data collected can be used

Local authority planning regulations, planting schemes to original plans, selection of plants for site requirements

Unit 322 Manage Heritage Gardens and Arboreta
Outcome 3 Be able to promote arboreta or heritage gardens

Assessment Criteria

The learner can:

1. Obtain current **information from customers**
2. Produce a **calendar of activities** to suit all age ranges, levels of interest and physical ability
3. **Plan activity in detail**, including risk assessment, costs, publicity and resources
4. Discuss considerations when planning activities, including commercial viability, child protection issues, visitor impact, access and safety

Unit content

Information from customers

Visitors aim on visiting establishment, expectations on visitor facilities, potential for revisiting, the visitor experience

Calendar of activities

Themed activities relating to seasons, age group of customers attending events, physical participation and lecture presentation

Plan activity in detail

Pre-publicity information, event timetable, resource/cost implications, risk assessment/liabilities, planning regulations, child protection requirements for physical activities, health and safety at work act/contingency planning, management of the visitor/car parking and refreshments, impact on visitor numbers on local infrastructure

Unit 322 Manage Heritage Gardens and Arboreta

Outcome 4 Be able to plan the management of an arboretum or heritage garden

Assessment Criteria

The learner can:

1. Plan a **five-year management plan** for a specific venue, taking into account the impact of public and financial pressures
2. Analyse the **management objectives** of a specific venue and make recommendations for improvement
3. Produce **interpretation material** for public education about the venue.

Unit content

Five-year management plan

Planning regulations, resource implications, infrastructure requirements, staffing and staff training

Management objectives

Aims of the site, public interest, financial investment

Interpretation material

Information material for different age groups and interest/knowledge of the subject

Media material to include publications, visual and interactive formats

Unit 322 Manage Heritage Gardens and Arboreta
Notes for guidance

This unit is designed to equip the learner with the knowledge of how to manage heritage gardens and arboreta. It is important that learners identify appropriate heritage gardens and arboreta which will have availability of data for learners to review. It is strongly recommended that learners visit the heritage garden or arboretum in order to assist their studies. Learners will need to be proactive and to be able to respond to the data on the heritage garden or arboretum in order to develop a full understanding on the aims and objectives of heritage gardens or arboreta.

In Outcome 1, learners will understand why arboreta or heritage gardens have developed.
The aim of organisations responsible for heritage gardens or arboreta will be investigated by the learner. The learner will relate public awareness of Heritage Gardens or arboreta to the facilities and resources made available to the general public visiting these sites. The learner will investigate the resources necessary to establish and maintain a heritage garden or arboretum. The financial implications of operating a heritage gardens or arboretum open to the general public will be fully investigated by the learner.

In Outcome 2 learners will identify the appropriate data necessary to evaluate the physical, financial and viability of a heritage garden or arboretum. Learners will relate physical resources to the range of plant material available and to accurately record the physical data to include technical and botanical information. Learners will investigate how collected data from the heritage garden or arboretum can be used constructively to further develop the resources and facilities the benefit of the heritage garden or arboretum.

In Outcome 3 learners will investigate the needs of the customer and relate the needs of the physical resources available at the heritage garden or arboretum. Learners will be proactive in developing a programme of events which will attract a targeted customer range in order to support the aims and objectives of the heritage gardens or arboretum.

In Outcome 4 learners will need to collate all the data collected in order to produce a realistic five-year management plan which clearly makes reference to staffing/volunteers and physical and financial resources necessary to complete recommendations. Learners will review existing management plans in order to relate them to current physical and financial factors. Methods of improving existing management plans the benefit of the heritage garden or arboretum and with specific reference to the visitor will be required. Learners will develop a range of publicity material which is targeted to different visitors groups in order to educate the visitor on the aims and objectives of the heritage gardens or arboretum.

References

Books

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Unit 323 Undertaking Woodland Habitat Management

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the principles of woodland habitat management and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The aim of this unit is to provide learners with the ability to recognise the features of woodland habitats and the skills required for their management.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Understand the historical development of woodland
2. Be able to survey the structures and features within a woodland ecosystem
3. Understand the management of woodland habitats
4. Be able to manage woodland habitats.

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU88 Manage habitats

EC23 Prepare, conduct and report on environmental change

Endorsement of the unit by a sector

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 323 Undertaking Woodland Habitat Management
Outcome 1 Understand the historical development of woodland

Assessment Criteria
The learner can:
1. Discuss the **historical influences** that have created the current level of woodland cover in the UK
2. Explain the development of **woodland types** and **management systems.**
3. Compare **historic features** within a woodland.

Unit content

Historical influences
Ice age, wildwood, Mesolithic, Neolithic, Bronze Age, Iron Age, Roman, Domesday Book, Middle Ages, Industrial Revolution, First World War, Forestry Commission, Second World War, post-war destruction, !950s and 60s greening. Forestry expansion, community forest initiative

Woodland types
Succession, National Vegetation Classification (wet woodlands, lowland, upland, scrub communities), ancient woodlands, ancient semi-natural, primary, secondary

Management systems
Coppicing, coppice with standards, wood pastures, pannage, wooded common

Historic features
Name, boundary shape, wood banks, out-grown hedges, ditches, pits, charcoal hearths, saw pits, tracks, woodlands indicator species

Unit 323 Undertaking Woodland Habitat Management

Outcome 2 Be able to survey the structures and features within a woodland ecosystem

Assessment Criteria

The learner can:

1. Report on the **structures and features** of a woodland **ecosystem**
2. Carry out a **survey** of a woodland

Unit content

Structure

Ground, field, shrub, canopy

Features

Name, boundary shape, wood banks, out-grown hedges, ditches, pits, charcoal hearths, saw pits, tracks, woodlands indicator species

Ecosystems

Broadleaved woodland, mixed woodland, coniferous woodland, coniferous plantations, coppice, coppice with standards

Survey

Species identification (flora and fauna)
Quantitative (for example quadrats and simple line transects) and qualitative (quality of habitat, species distribution), correlation of species and effects of abiotic factors
Recording, mapping, present information from surveys in various forms (written, data and pictoral) graphs, pie chart, basic statistics
Risk assessment: identification of potential risks and hazards, severity of potential injury (hazard), likelihood of harm (risk), control methods to minimise or avoid risk

Unit 323 Undertaking Woodland Habitat Management
Outcome 3 Understand the management of woodland habitats

Assessment Criteria
The learner can:
1. Evaluate different types of **woodland habitats** and relevant **management techniques**
2. Prepare **equipment and resources** for practical management of woodland habitats

Unit content

Woodland habitats
Glades, rides, woodland edges, veteran trees, deadwood, ponds, streams, bog, thicket, dense shade

Woodland management techniques
Management plan, health and safety, planting/sowing (trees, shrubs and ground flora), natural regeneration, thinning, clearance, coppice, agroforestry, silvicultural systems

Equipment and resources
Personal Protective Equipment (PPE) (e.g. boots, safety helmet, waterproof clothing, gloves), first aid kit, planting equipment, fencing equipment, pruning equipment, saw, tools for vegetation clearance, coppicing tools, maintenance (e.g. cleaning, oiling, sharpening)

Unit 323 Undertaking Woodland Habitat Management
Outcome 4 Be able to manage woodland habitats

Assessment Criteria
The learner can:
1. Safely carry out **practical management** of woodland habitats
2. Recommend **improvements** to the management of woodland habitats

Unit content

Practical management
Aims, objectives, management plan, health and safety, planting/sowing (trees, shrubs and ground flora), natural regeneration, thinning, clearance, coppice, ride creation, glade creation, pond creation, deadwood introduction, bird boxes, bat boxes

Improvements
Increased diversity, invasive species control, sustainable management, habitat creation, waste management

Unit 323 Undertaking Woodland Habitat Management
Notes for guidance

This unit is designed to provide the learner with sound knowledge and skills required to recognise features of woodland habitats and prepare, plan and undertake practical management of woodland habitats. Learners will develop an understanding of the historical influences that have affected woodland cover and understand the range of woodland habitats present today. An understanding of the management techniques available for woodland habitats will be developed along with the opportunity to put some techniques into practice. The unit should cover a wide range of possible activities and potential sites.

Throughout the unit the emphasis should be on safe working and sustainability. It is expected that learners will be aware of safe working practices and be familiar with accepted practices and behaviours within the context in which they are working. The importance of sustainable practices should be woven into the delivery throughout.

In Outcome 1, the leaner will be required to understand how woodland cover has been influenced historically and has led to the development of different woodland types and management systems. Learners should develop an appreciation of the potential historical features within woodland. It is anticipated that the delivery of this outcome will be through formal lectures and discussion but should also be delivered through independent learner research and site visits (e.g. to ancient woodland).

Outcome 2 covers woodland surveying. It is anticipated that the delivery of this outcome will contain some formal lectures and discussion, but it requires site visits to woodland and supervised classroom activities. It may be beneficial to have visiting expert speakers to add relevance to the subject particularly those that have been involved woodland habitat surveys. Learners will develop their identification skills and an appreciation of the structures that make up woodlands.

In Outcome 3, the learner will develop an understanding of the management techniques relevant to different woodland habitats. Emphasis should be placed on correct planning and health and safety. It is anticipated that the delivery of this outcome will be mainly through formal lectures and discussion but the addition of guided visits to habitats under successful management would add context.

In Outcome 4, the learner will be able to put into practice knowledge gained from the other learning outcomes. This outcome will require some formal delivery but it is expected that most will be delivered through practical activities. Learners will prepare for and undertake practical woodland habitat management. The emphasis should be heavily placed on health and safety throughout the delivery of this outcome. Learners will also have the opportunity to discuss improvements to the management of woodland habitats.

This unit aims to extend the learners knowledge and skills involved with woodland habitat management. Emphasis should be placed upon the importance of planning and health and safety. Centres are encouraged to introduce employers and specific professionals from industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of woodlands to add depth to the learner experience and put practices into context.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive lessons in a real environment. Learners must be given

the opportunity to deal with a range of activities in different situations that reflect current industry trends

References

Books

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Websites

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www.naturalengland.org.uk	Natural England
www.rfs.org.uk	The Royal Forestry Society
www.woodlandtrust.org.uk	The Woodland Trust

Unit 324 Business Management in the Land-based Sector

Level: 3

Credit value: 10

Unit aim

The learner will look at the business, the role and responsibilities of those employed in land-based businesses and resource requirements. They will develop their skills in business operations and produce a business plan.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Know the breadth and importance of an industry in the environmental and land-based sector
2. Understand business resources and structures
3. Understand the business marketplace
4. Understand how to use financial and physical record keeping systems

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

n/a

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge

Unit 324 Business Management in the Land-based Sector

Outcome 1 Know the breadth and importance of an industry in the environmental and land-based sector

Assessment Criteria

The learner can:

1. Describe the **importance** of businesses within the industry **to the economy**
2. Outline the range of **associated businesses** allied to the industry

Unit content

Importance to the economy

Using measures available to the industry, e.g. value of output, contribution to Gross Domestic Product (GDP), employment, land use, economic and social benefits, trends in importance

Range of organisations: typical types of businesses and other organisations (e.g. representative, regulatory, not-for-profit) within the sector, regional variations, changes and developments in the last 50 years

Associated businesses

Relevant industries in primary, secondary and tertiary industrial sectors (e.g. suppliers of raw materials, processors, distributors, retailers, service providers)

Associated organisations: specific interrelationships between one business and other associated organisations e.g. suppliers of goods and services, representative organisations and professional bodies, regulatory bodies, competitors, customers, aims and roles of important organisations in the sector

Unit 324 Business Management in the Land-based Sector
Outcome 2 Understand business resources and structures

Assessment Criteria

The learner can:

1. Explain the **legal structure and organisation** of a land-based business
2. Explain the **physical resource requirements** of a selected land-based business
3. Describe different **job roles and responsibilities** in a selected land-based business

Unit content

Legal structure and organisation

Features of the main business types, e.g. sole trader, partnership, limited company, not-for-profit organization, charity, public sector organisations, organization staffing structure

Physical resource requirements

Property (forms of tenure, appraisal of business potential), vehicles and machinery, tools and equipment, stocks (stock control procedures), insurance of physical resources

Job roles and responsibilities

Job roles relevant to the sector, e.g. director, manager, supervisor, team worker, trainee, administrator, volunteer, sub contractor, job title, job description, responsibilities for financial, physical and human resources, staff motivation and performance management, person specification (typical skills, qualifications and experience required to fulfil the role), legal rights and responsibilities in work (e.g. pay, working hours, holidays, equal opportunities, health and safety, employment protection), relevant employment legislation

Unit 324 Business Management in the Land-based Sector

Outcome 3 Understand the business marketplace

Assessment Criteria

The learner can:

1. Describe the **marketplace, customers and competitors** for a land-based business
2. Explain features of an efficient **supply chain** in a land-based context
3. Review **quality management** systems and practices within a land-based business

Unit content

Marketplace, customers and competitors

Size of market (e.g. value of sales, number of customers), external influences on the market (political, economic, socio-cultural, technological), customer base (number, type, characteristics, market segments), direct and indirect competitors, competitor analysis, market share

Supply chain

Suppliers, distributors, customers, choosing suppliers, ensuring supplies of inputs, supply chain assurance (e.g. environmental, animal welfare)

Quality management

Important aspects of quality in the sector, formal quality standards or approval (e.g. Farm Assured, ISO 9000, BHS approval), informal systems and practices to achieve quality, problems arising if quality is not achieved

Unit 324 Business Management in the Land-based Sector

Outcome 4 Understand how to use financial and physical record keeping systems

Assessment Criteria

The learner can:

1. Review **financial records** for a selected land-based business
2. Examine **physical records** for a selected land-based business
3. Examine the use of financial and physical records in **monitoring business performance and progress**

Unit content

Financial records

Importance of keeping accurate records (legal requirements and management efficiency), purchasing and ordering procedures, order forms and orders, deliveries and receipts, invoices and sales records, credit control, payment methods, bookkeeping (cash analysis, petty cash, cash flow, budgets, computer accounts programmes), basic accounts (trading account, balance sheet, depreciation), taxation (VAT, income tax PAYE, national insurance contributions, corporation tax), wage calculation

Physical records

Records appropriate to the industry relating to e.g. production, inputs, staffing, customers, resource use, data protection, legal requirements to keep records, e.g. pesticide use, veterinary medicines, transport, animal movement, passports

Monitor business performance and progress

Use of financial and physical records to monitor business performance, e.g. production levels, costs of production, financial efficiency, monitoring against targets, budgets, previous periods, relevant review periods (e.g. weekly, monthly, annually), appropriate remedial actions, staff roles in recording and analysing information

Unit 324 Business Management in the Land-based Sector
Notes for guidance

This unit is designed to provide the learner with an understanding of the business aspects of their industry. It is applicable to all sectors of the environment and land-based sector and learners focus their study on the sector most relevant to their vocational interests.

In Outcome 1 they will investigate the size, scope and importance of their specialist sector within the environment and land-based industries, and how this has developed over the last 50 years or so. For some sectors this type of information is more readily available than other (e.g. agriculture), so learners should be supported in accessing whatever information is available relevant to their sector. They will also investigate the range of business types and other organisations that are represented in their sector, including important regulatory, professional or representative organisations. Wherever possible this should be related to specific businesses and organisations. This outcome is likely to require formal teaching, which should be supported by relevant information on businesses and organisations within the sector, and could include speakers representing these. Independent study and investigation should also be encouraged.

Outcome 2 focuses on the legal and resource implications of constituting a business. They will learn about the range of business organisations in the private and public sectors, and the legal and practical implications of different business types. This should be related to the types of business important in their sector. Learners will investigate the physical resource requirements of businesses, and how they are managed. It would be appropriate for learners to undertake a case study on a business premises in their sector and appraise its strengths and weaknesses for a given business use. The understanding that learners will gain on job roles and responsibilities has links with the requirements for Work Experience, and employers could be invited to explain their expectations in the workplace. The learners' investigations should focus on job roles within their specialist sector.

In Outcome 3 learners will analyse the market for a specific land-based business. This could involve a case study project and should identify, for that business, information on the content listed. External influences should be relevant and current to that business. Specific competitors should be identified and analysed to identify strengths and weaknesses to the case study business. When investigating the supply chain learners will need to identify the flow of resources from production of raw materials, through relevant manufacture and processing, to end consumers. Quality management will include reference to any formal standards or approvals that are relevant. It should also consider the quality standards required by the industry, any systems and practices that are used to achieve quality, and implications of failing to meet prescribed or assumed levels of quality. This should be related to specific businesses and teaching could again be supported by relevant visiting speakers from industry.

Outcome 4 focuses on the range of financial and physical records that are required to meet legal requirements as well as to ensure effective business operation. Learners will need to be able to complete simple examples of the range of financial records listed. They should be aware of paper-based and computerised systems for financial records but are not expected to become competent in the use of IT accounts software. The range of physical records investigated should be related to the needs of the learners' specialist sector, and should include important current examples of legally required records. This content could link with other specialist vocational units. In addition to completing a range of records, learners will investigate how specific examples can be used to aid decision making, monitor and control business performance.

Centres are encouraged to introduce employers and specific professionals from industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of establishments to add depth to the learner experience.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive lessons in a real environment.

References

Books

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Unit 325 Undertake Estate Skills

Level: 3

Credit value: 10

Unit aim

This unit aims to introduce learners to the estate skills and knowledge and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or into further/higher education.

The learner will look at constructing, repairing and maintaining boundaries, structures and surfaces. They will build their experience and confidence in using practical skills in a range of situations. The learner will be able to contextualise practical management work to a particular habitat that lies within their primary area of learning.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Be able to construct, repair or maintain boundaries
2. Be able to construct, repair or maintain structures
3. Be able to construct, repair or maintain surfaces
4. Be able to carry out practical habitat management work

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU22.1 Construct maintain and repair boundaries
CU20.1 Maintain structures and surfaces

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SCC

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge

Unit 325 Undertake Estate Skills

Outcome 1 Be able to construct, repair or maintain boundaries

Assessment Criteria

The learner can:

1. **Prepare the site** appropriately
2. Select appropriate **equipment and materials**
3. Carry out the **construction, repair or maintenance** of selected **boundaries** to meet given specifications

Range

Boundaries

Living boundaries (hedge, bank, ditch), constructed boundaries: fence (post and rail, post and wire, electric, netting), wall (stone, brick)

Unit content

Prepare the site

Plan activity, clear debris, ensure livestock safety, location (power supply, waste disposal, equipment and materials storage)

Equipment and materials

Materials selected relevant to task, health and safety, sustainable practice, cost implications

Construction, repair or maintenance

Undertaken safely (use of risk assessment, appropriate Personal Protective Equipment (PPE)) and to the required standards

Unit 325 Undertake Estate Skills
Outcome 2 Be able to construct, repair or maintain structures

Assessment Criteria
The learner can:
1. **Prepare the structure** appropriately
2. Prepare and ready appropriate **equipment and materials**
3. Carry out the **construction, repair or maintenance** of selected **structures** to meet given specifications.

Range

Structures
Wooden structures (gate, stile, horse jump, bird box, table, bench, door), other structures requiring repair or maintenance (animal house or pen, machinery or feed store)

Unit content

Prepare the structure
Cut required sizes, wood preparation (sanding, planing, filling), check design specification, plan activity

Equipment and materials
Equipment and materials prepared based on manufacturer instructions, health and safety, sustainable practice, cost implications

Construction, repair or maintenance
Undertaken safely (use of risk assessment, appropriate Personal Protective Equipment (PPE)) and to the required standards

Unit 325 Undertake Estate Skills
Outcome 3 Be able to construct, repair or maintain surfaces

Assessment Criteria
The learner can:
1. **Prepare the surface** appropriately
2. Prepare and ready appropriate **equipment and materials**
3. Carry out the **construction, repair or maintenance** of a selected **surface** to meet given specifications.

Range

Surface
Solid (decking, concrete, paving), Loose (gravel, wood chippings, sand)

Unit content

Prepare the surface
Plan activity, clear debris, ensure livestock safety, location (power supply, waste disposal, equipment and materials storage)

Equipment and materials
Equipment and materials prepared based on manufacturer guidelines, health and safety, sustainable practice, cost implications, timeliness for example preparing concrete at the right time for construction

Construction, repair or maintenance
Undertaken safely (use of risk assessment, appropriate Personal Protective Equipment (PPE)) and to the required standards

Unit 325 Undertake Estate Skills

Outcome 4 Be able to carry out practical habitat management work

Assessment Criteria

The learner can:

1. Carry out appropriate **risk assessments**
2. Safely carry out appropriate **practical habitat management** to given specifications
3. Recommend **improvements** for future work

Unit content

Risk assessments

Risk assessments completed and used, use of Personal Protective Equipment (PPE) appropriate to the tasks (safety boots, overalls, gloves, and eye protection), and safe methods of working
Relevant legislation and codes of practice: Health and Safety at Work etc Act 1974, Control of Substances Hazardous to Health (COSHH) 2002, Waste Management (England and Wales) Regulations 2006, Construction (Design and Management) Regulations 2007

Practical habitat management

Mowing, renovation, planting and staking as applicable, clearing (path, fence line), coppicing, uprooting, hedge maintenance, pruning, thinning, cutting or mowing and mulching, pond, stream and ditch clearance
Good practice: composting, materials that can be composted, re-used and/or recycled, finding alternative uses, methods of recycling, avoid wastage
Reduce environmental damage - Pollution (water courses, through litter or debris, noise), damage to habitats, and wastage of resources
Disposal of waste: organic waste (recycling, composting, chipping, burning), inorganic waste (recycling, landfill, discarding safely)

Improvements

Setting habitat management objectives, planning activities and resources, monitoring activities and resources, reviewing outcomes against objectives, recommendations and improvements

Notes for guidance

This unit has a very practical focus, and aims to enable learners to develop estate skills which can be applied to a range of situations and circumstances. The unit has been written such that naturally occurring and locally relevant opportunities can be used in selecting sites, structures and surfaces to construct, repair or maintain.

As learners will be engaged in practical activity there should be an emphasis on safe working practices, including the use of appropriate personal protective equipment (PPE), and appropriate risk assessments should be undertaken. At Level 3 it is expected that learners will take an active part in completing risk assessments, so that this becomes an integral part of all practical activity. Learners should also be made aware of the impact on the environment, and sustainability concepts should also be demonstrated where possible.

Learners should have the opportunity to undertake estate skills activity in a land-based setting wherever possible to maximise the vocational relevance. It will be most beneficial if the structures, boundaries and surface selected are for a clear purpose above and beyond delivery of this unit. It is recognised that there will not be opportunities to carry out construction, repair *and* maintenance in each of the categories, but it would be appropriate for the skills of construction, repair and maintenance to each be developed in one aspect of the unit.

In Outcome 1, learners will develop the practical skills needed to construct, repair or maintain at least two different boundaries, including a living boundary and a constructed one.

In Outcome 2, learners will construct, repair or maintain at least two different structures. It is anticipated that learners will develop an understanding of how to construct a wooden structure, but are not expected to be able to construct larger structures such as animal or machinery housing. It is anticipated that delivery will include repair and maintenance of such larger structures as would be found in an estate setting.

In Outcome 3, learners are required to construct, repair or maintain one surface from the range shown. Delivery may include visits to see a range of surfaces and their properties and maintenance requirements.

In Outcome 4 it is anticipated that delivery of this outcome will be embedded in the practical skills development within the other three outcomes. These outcomes could also be developed in conjunction with learners' work experience at an appropriate placement.

It is anticipated that most delivery of this unit will take place in a practical setting, with supervised practice of skills. Delivery will also include some classroom based activity in ensuring learners have a good understanding of planning, materials selection and preparation, and underpinning knowledge.

References

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www.defra.gov.uk	Department for Environment, Food and Rural Affairs
www.wales.gov.uk	Welsh Assembly Government
www.scotland.gov.uk	Scottish Executive Environment and Rural Affairs Department
www.dardni.gov.uk	Department of Agriculture and Rural Affairs (Northern Ireland)
www.fwag.org.uk	Farm Wildlife and Advisory Group
www.hse.gov.uk	Health and Safety Executive
www.lantra.co.uk	Lantra Sector Skills Council

Unit 326 Undertake Arboricultural Skills

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the arboricultural skills (aerial) and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learner will be able to develop the skills and knowledge required to carry out aerial arboricultural operations, including branch removal, simple pruning and dismantling of small to medium sized trees. The relevant health and safety and other legislation is also covered. The learner will also be able to support an aerial arborist by assisting with lowering branches and carrying out aerial rescue.

This unit will **not** directly lead to certification of competence to Level 2 Award Climb Trees and Perform Aerial Rescue, or the Level 2 Award in Chainsaw and Related Operations, but can provide preparative training towards these qualifications.

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. Be able to use a chainsaw in a tree to carry out branch removal
2. Be able to prune and dismantle small to medium trees
3. Know the requirements for using a chainsaw for aerial work in trees
4. Understand the legal and safety implications
5. Be able to support tree climbing operations

Guided learning hours

It is recommended that **60** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW26 Support colleagues undertaking off ground arboriculture operations
TW36 Carry out aerial rescue from a tree

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 326 Undertake Arboricultural Skills

Outcome 1 Be able to use a chainsaw in a tree to carry out branch removal

Assessment Criteria

The learner can:

1. Carry out a **risk assessment**
2. Select and use safely **appropriate equipment**
3. **Climb safely and efficiently to the required working positions**
4. **Remove branches leaving the tree to the required specification**
5. Work with ground staff to achieve a **safe working environment**

Unit content

Risk assessment

Identification of appropriate hazards and risk levels
Site and ground conditions, weather conditions, tree condition, operator, machine and task, public access and rights of way/highways, power lines, noise levels
Risk control and reduction, establishment of safety zones, emergency procedures, rescue equipment, first aid provision, refuelling site, Personal Protective Equipment (PPE)
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Appropriate equipment

Climbing and lowering ropes: static, semi-static, dynamic
Climbing knots: Prussik, bowline, figure-of-eight
Harnesses, karabiners, strops, slings, throwlines, friction devices, rope grabs, chainsaws, cambium savers, pulleys

Climb safely and efficiently to the required working positions

Safe access procedures: ladders, Mobile Elevated Work Platforms (MEWPs), rope and harness, climbing irons
Safe work positioning techniques: selection of appropriate anchor points and supplementary anchor points, changing of anchor points, re-directs, rope organisation, branch walking

Remove branches leaving the tree to the required specification

Remove branches: appropriate work positioning, safe and efficient chainsaw operation, appropriate cuts, safe and appropriate use of lowering equipment
Required specification: BS3998, client's requirements, tree preservation order permission
Controlled descent, retrieval and correct storage of equipment, worksite left in a safe and tidy condition, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Safe working environment

Brief and direct ground staff, effective communications, continuous awareness of hazards, appropriate rescue equipment available

Unit 326 Undertake Arboricultural Skills
Outcome 2 Be able to prune and dismantle small to medium trees

Assessment Criteria
The learner can:
1. Carry out **simple pruning operations** on small trees
2. Understand how to **dismantle small to medium trees**

Unit content

Simple pruning operations
Pruning equipment: chainsaws, secateurs, handsaws, loppers,
Pruning operations: crown thinning, crown reduction, crown raising, crown reshaping and formative pruning, crown lifting, deadwooding, brashing, pollarding, coppicing
Correct selection of branches to remove, effective communications, safe and appropriate work positioning, accuracy of cuts, minimise damage to residual tree, worksite left in a safe and tidy condition, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Dismantle small to medium trees
Correct sequence of cuts, safe and appropriate work positioning, effective communications, accuracy of cuts, worksite left in a safe and tidy condition, appropriate disposal of waste, prevention of pollution, minimise environmental impact

Unit 326 Undertake Arboricultural Skills

Outcome 3 Know the requirements for using a chainsaw for aerial work in trees

Assessment Criteria

The learner can:

1. Define the terms Target pruning, Branch bark collar, Branch bark ridge
2. Describe pruning and branch lowering techniques
3. Identify the equipment available for pruning and dismantling

Unit content

Define the terms Target pruning, Branch bark collar, Branch bark ridge

Definitions as per British Standard 3998: Recommendations for Treework

Pruning and branch lowering techniques

Pruning techniques: crown thinning, crown reduction, crown reshaping and formative pruning, crown lifting, deadwooding, pollarding

Branch lowering techniques: lowering and friction systems

Equipment available for pruning and dismantling

Cutting equipment: chainsaws, secateurs, handsaws, loppers, polesaws

Lowering ropes, friction devices, pulleys, cranes, climbing irons

Unit 326 Undertake Arboricultural Skills
Outcome 4 Understand the legal and safety implications

Assessment Criteria
The learner can:
1. Explain the **legal and safety implications associated with tree pruning and dismantling**

Unit content

Legal and safety implications associated with tree pruning and dismantling
Stature law examples – felling licenses, planning processes, Conservation areas, Tree Preservation Orders (TPOs), Town and Country Planning Act 1990, Town and Country Planning (Trees) Regulations 1999, Forestry Act 1967, Provision and Use of Work Equipment Regulations 1998 (PUWER), Lifting operations and Lifting Equipment Regulations 1998 (LOLER), Work at Height Regulations 2005, Health and Safety at Work etc Act 1974, Management of Health and Safety at Work Regulations 1999, Wildlife and Countryside Act 1981, Environmental Protection Act 1990
Requirements for inspection of equipment, risk assessments, Personal Protective Equipment (PPE), establishment of safety zones, emergency procedures, rescue equipment, first aid provision, appropriate disposal of waste, protected species, prevention of pollution, minimise environmental impact
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Unit 326 Undertake Arboricultural Skills
Outcome 5 Be able to support tree climbing operations

Assessment Criteria
The learner can:
1. Demonstrate **climbing and aerial rescue techniques**
2. **Assist from the ground** in tree pruning and removal operations
3. **Dispose of arisings in accordance with safe working practices and environmental considerations**

Unit content

Climbing and aerial rescue techniques
Rescue planned, suitable anchor point, efficient movement to casualty, situation made safe, connection of casualty to rescuer's climbing system, controlled descent

Assist from the ground
Effective communication systems, safe refuelling of equipment, safely provide climber with equipment, assist with lowering of materials, awareness of hazards, stack materials for disposal, prevention of pollution, minimise environmental impact

Dispose of arisings in accordance with safe working practices and environmental considerations
Environment Protection Act 1990, Environmental Protection (Duty of Care) Regulations 1991, Waste Management Licensing Regulations 1994, Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991
Registered professional collector and / or dealer of waste (agricultural waste only), registered waste carrier or broker, register with Environment Agency (or equivalent), Waste Transfer Notes (WTNs) and record keeping

Unit 326 Undertake Arboricultural Skills
Notes for guidance

This unit is designed to provide the learner with the sound knowledge and the skills required to safely undertake aerial arboricultural operations. Consideration should be given to the seasonal nature and timing of pruning in relation to tree species.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner should be aware of basic safe working practices with a chainsaw but is unlikely to be familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for the learner to operate machinery and climb trees therefore health and safety issues relevant to the operation of the machinery used and aerial treework must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessments.

Any legal permission required to prune or fell trees must be obtained and equipment/machinery being used must comply with relevant requirements of the Provision and Use of Work Equipment Regulations (PUWER) 1998 and Lifting operations and Lifting Equipment Regulations 1998 (LOLER). Adequate Personal Protective Equipment (PPE) appropriate to the learner, the equipment and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual.

In Outcome 1 the learner will be required to use a chainsaw in a tree to carry out branch removal. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments. It is necessary for the learner to be given provided with appropriate climbing and access equipment to undertake this outcome and to have received sufficient preparatory training in the safe use of chainsaws, tree climbing and work positioning. The learner must not be required to work on hazardous trees or work sites where the level of risk is deemed to be unacceptable.

In Outcome 2, the learner will be required to prune and dismantle small to medium trees. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments. It is necessary for the learner to be given the opportunity to undertake a range of types of pruning work. The learner must not be required to work on hazardous trees or work sites where the level of risk is deemed to be unacceptable.

In Outcome 3, the learner will be required to know the requirements for using a chainsaw for aerial work in trees. It is anticipated that the delivery of this outcome will be delivered in association with outcomes 1, 2 and 5 through supervised practical training and the learner able to consolidate knowledge within realistic working environments. Continual reference should be made to current industry best practice guidance and standards. It would be beneficial to include learning within the wider context of tree biology and science. Reference and links to current wound response theories and pathogen infection mechanisms would enhance the learner's understanding.

In Outcome 4, the learner will be required to understand the legal and safety implications of aerial arboricultural work. It is anticipated that the delivery of this outcome will be delivered in association with outcomes 1, 2 and 5 through supervised practical training and the learner able to consolidate knowledge within realistic working environments. Learners should focus upon legislation specific to

their location within the UK and understand the importance of maintaining an awareness of current legislation and Codes of Practice which may relate to tree pruning and dismantling.

In Outcome 5, the learner will be required to support tree climbing operations. It is anticipated that the delivery of this outcome will be delivered through supervised practical training and the learner able to consolidate operational skills within realistic working environments.

This unit will not directly lead to certification of competence to Level 2 Award Climb Trees and Perform Aerial Rescue, or the Level 2 Award in Chainsaw and Related Operations, but can provide preparative training towards these qualifications.

If learners want to achieve the above qualifications they will need to register and take the assessment separately through City & Guilds.

A learner working towards level 3 is unlikely to have experience of practical arboricultural activities. This unit aims to develop the learner's knowledge and skills involved with the safe use of chainsaws, tree climbing and related operations. Emphasis should be placed upon 'doing' and developing practical experience, the learner should be given appropriate time to develop their skills. It is important that the learner understands the importance of maintaining an awareness of current legislation and Codes of Practice in relation to tree climbing and related operations.

Centres are encouraged to introduce employers and specific professionals from the arboricultural industry, such as contractors and consultants to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner experience. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of aerial arboricultural work and the limitations imposed by bad weather.

It is accepted that formal lectures may be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive practical lessons in a real environment. The learner should be given the opportunity to undertake a range of arboricultural operations on different sites and situations which reflects current industry practice.

References

Books

Arboricultural Association. 1994. *A Guide to Tree Pruning.* Cheltenham: Arboricultural Association. ISBN 090097821X.

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Mynors, C. 2002. The Law of Trees, Forests and Hedgerows. London: Sweet and Maxwell. ISBN 0421590408.

Shigo, A.L. 1989. Tree Pruning: A Worldwide Photo Guide. Snohomish: Shigo and Trees Associates. ISBN 0943563089.

Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Journals

Arboricultural Advisory Information Service publications
Arboricultural Association newsletter
Journal of Arboriculture

Unit 327 Understand the Principles of Tree Felling and Chainsaw Use

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the principles of chainsaw maintenance, felling small trees (200- 300mm at felling height) and stump removal and how these can be applied in practice. This unit is aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learner will identify and understand a range of petrol-driven chainsaws and felling techniques currently used within the industry, to develop efficient chainsaw maintenance skills and to carry out basic repairs and troubleshooting.

This unit will **not** directly lead to certification of competence in the Level 2 Award in Chainsaw and Related Operations. This unit could be used to contribute towards preparative training for the Level 2 Award in Chainsaw and Related Operations or the Level 3 Certificate of Competence in the Thorough Examination of Arboricultural Equipment.

If learners want to achieve the Level 2 Award in Chainsaw and Related Operations they will need to register and take the assessment separately through City & Guilds.

Learning outcomes

There are **four** learning outcomes to this unit. The learner will:

1. Be able to correctly maintain chainsaws to manufacturer's recommendations
2. Be able to safely fell and cross cut small diameter trees
3. Be able to safely use stump and brushchipping removal methods
4. Understand commonly used stump and brushchipping removal and tree felling methods

Guided learning hours

It is recommended that **60** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

TW10 Fell small trees using a chainsaw

TW12 Cross cut small diameter timber using a chainsaw

TW14 Stack crosscut timber manually

TW41Survey and inspect trees

TW42 Soil amelioration for tree health

TW43 Undertake emergency arboricultural operations

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- An assignment covering practical skills and underpinning knowledge.

Unit 327 Understand the Principles of Tree Felling and Chainsaw Use

Outcome 1 Be able to correctly maintain chainsaws to manufacturer's recommendations

Assessment Criteria

The learner can:

1. Safely carry out **maintenance operations** on selected chainsaws in accordance with manufacturer's recommendations and health and safety guidelines
2. Identify **common faults** in chainsaws

Range

Maximum guide bar length of 380mm (15")

Unit content

Maintenance operations

Visual inspection

Operations to include: removal and cleaning of air filter, removal and checking of spark plug removal, checking and maintenance of bar and chain, sharpening of chain, checking of anti-vibration mounts, oil and fuel check

Common faults

To include: uneven sharpening (left/right hand), incorrect depth gauges, bent bar, blocked air filter, on/off switch, poor or incorrect fuel mix, lack of chainsaw oil, worn bar, worn chain, worn anti vibration mounts, slack chain, dirty chainsaw

Unit 327 Understand the Principles of Tree Felling and Chainsaw Use

Outcome 2 Be able to safely fell and cross cut small diameter trees

Assessment Criteria

The learner can:

1. **Assess risks** prior to felling and cross cutting operations
2. **Safely fell and cross cut** selected small diameter trees to meet given objectives
3. **Dispose of waste** appropriately

Range

Tree up to 380mm in diameter at felling height

Unit content

Assess risks

Risks to include: ground conditions, undergrowth, escape routes, weather conditions, overhead power lines, loose or dangerous limbs overhead, local dangerous trees including leaning trees, windblown, dead and rotten, wires, fencing, metal in tree at cutting level

Safely fell and cross cut

Safely factors to include: risk assessment carried out, escape routes established, felling only if safe to do so, direction of fell
Fell: correct use of chainsaw, choice and positioning of cuts, depth of hinge, body positioning/stance
Cross cut: to meet requirements, avoiding hitting ground with bar and chain, work technique, avoidance of 'pinching' of bar

Dispose of waste

Meeting requirements of site, cutting to suitable size if required, stacking as required, possible burning or removal, provision of saleable product

Unit 327 Understand the Principles of Tree Felling and Chainsaw Use

Outcome 3 Be able to safely use stump and brushchipping removal methods

Assessment Criteria

The learner can:

1. Select **appropriate stump and brushchipping removal methods and equipment**
2. **Safely use** appropriate stump and brushchipping removal methods
3. Identify **environmental impacts** of removal methods used

Unit content

Appropriate stump and brushchipping removal methods and equipment
Guarding, Personal Protective Equipment, manual handling techniques, mechanical aids, stabilisers, safety trip bar

Safely use
Signage and barriers as appropriate, Personal Protective Equipment to include both eye and ear protection, adherence to codes of practice, use in accordance with manufacturer's instructions
Reinstatement of soil and ground post extraction

Environmental impact
To include: noise, waste product, dust, chippings, exhaust gas pollution, possible hydraulic oil pollution, visual damage, damage to ground and soil

Unit 327 Understand the Principles of Tree Felling and Chainsaw Use

Outcome 4 Understand commonly used stump and brushchipping removal and tree felling methods

Assessment Criteria

The learner can:

1. **Evaluate** commonly used stump and brushchipping removal methods
2. Assess different **problem trees**
3. Evaluate **methods for felling problem trees**
4. Explain the **uses** of chainsaws
5. **Assess tree felling activities** carried out
6. Explain the **maintenance** of chainsaws

Range

Small trees up to 380mm in diameter at felling height

Unit content

Evaluate

Factors include: availability, cost (purchase and hire), access, waste, customer requirements, tree species

Problem trees

To include: leaning trees, trees with damage, trees with rot, dead trees, trees in difficult location, trees close to other objects, leaning trees, hung-up trees

Methods for felling problem trees

To include: dismantling, use of platforms, specialist cutting techniques

Uses

Felling, cross cutting, delimbing, snedding, logging, surgery

Assess tree felling activities

Suitability for purpose, end product, disposal of waste, finished state of site, cost, labour involved, environmental impact, disturbance to public, risk involved

Maintenance

Cleaning, sharpening, air filter, bar, spark plug, fuel and oils, checking of anti-vibration mounts

Unit 327 Understand the Principles of Tree Felling and Chainsaw Use

Notes for guidance

This unit is designed to provide the learner with a sound knowledge of chainsaws and their use and the skills required to use a chainsaw to fell and cross cut small trees. It also enables them to remove stumps and to identify and evaluate, but not deal with, problem trees.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for the learner to operate machinery, therefore health and safety issues relevant to the equipment and tasks involved must be stressed and regularly reinforced. Adequate Personal Protective Equipment (PPE), appropriate to the learner, the equipment and the task must be provided and worn in accordance with the associated risk assessment, industry and operator's manual.

Outcome 1 enables the learner to both carry out routine maintenance tasks on a chainsaw and to recognise common chainsaw faults. The faults may be engine related, assembly related or evident by chainsaw use and identified by cutting problems. It is important here that safe working practices are adhered to and correct PPE worn for working on the chainsaw. This outcome is best initially delivered in a workshop context with eventual move to a working woodland environment. Emphasis should also be put on the need for cleanliness throughout. The requirement for regular maintenance and sharpening and use of the manufacturer's manuals should also be identified.

This unit will **not** directly lead to certification of competence in the Level 2 Award in Chainsaw and Related Operations. This unit could be used to contribute towards preparative training for the Level 2 Award in Chainsaw and Related Operations or the Level 3 Certificate of Competence in the Thorough Examination of Arboricultural Equipment.

If learners want to achieve the Level 2 Award in Chainsaw and Related Operations they will need to register and take the assessment separately through City & Guilds.

In Outcome 2 the learner is required to assess a site and if safe to do so fell small diameter trees, cross cut them and dispose of waste. It is recommended that simple trees are used initially and as the learner gains confidence and experience then the working area can be more real. It is advised that simulation of a real working environment is used in the first instance. Pre- start checks and safe starting techniques must form part of this outcome.

In Outcome 3 the learner is required to understand the methods and equipment available for stump removal and to select and use an appropriate method for a given situation. Particular attention must be made to safe working practice and the need for PPE. Possible danger to the public and fellow workers needs to be emphasised. Where winching is carried out, the learner needs to be aware of how to check and maintain cables and the particular danger of their use.

In Outcome 4 the learner is required to assess a number of factors involved with tree felling and chainsaw use (these include problem trees). The learner will learn to identify problem trees but will not work on them. The learner will be made aware of methods of dealing with problem trees. This can all be taught in a real working environment. It is essential that risk assessments are carried out and the

learner is not put at risk when examining problem trees. It is possible that some of this may initially be taught in the classroom using slides or PowerPoint presentations. The uses and maintenance of chainsaws will also be understood.

Finally the learner will gain the knowledge required to be able to assess an operation involving felling that has been carried out.

Centres are encouraged to introduce employers and specific professionals from the forestry or arboricultural industry, such as dealers or chainsaw operators to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites to add depth to the learners experience by offering a range of trees and scenarios.

It is accepted that some formal lectures will be necessary. However, it is recommended that these are linked to considerable interactive practical lessons in a real working environment.

References

Books

Ireland D., 2004. *Winching Operations in Forestry*. The Staionary Office. ISBN 085538638X

Kestel B., 2005. *Chainsaw Operators Manual: The Safe Use of Chainsaws*. Landlinks Press. ISBN 0643090282

Shetterly R. & Blair D., 1995. *Arborist Equipment: A Guide to the Tools and Equipment of Tree Maintenance and Removal*. International Society of Arboriculture. ISBN 188195613X

Journals

Arboricultural Association Newsletter

Forestry and British Timber

Leaflets

FASTCO chainsaw leaflets

Unit 328 Understanding Principles of Land-based Machinery

Level: 3

Credit value: 10

Unit aim

This unit aims to provide learners with an understanding of the principles of land-based machinery and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The aim of this unit is to provide learners with skills, knowledge and understanding to enable them to select, evaluate, maintain and repair a range of land-based machines typical to their area of study.

Learning outcomes

There are four learning outcomes to this unit. The learner will:

1. Know the function of key components found in land- based machines and power units
2. Understand operating principles of land-based machines and power units
3. Be able to undertake routine maintenance of land-based machines and power units
4. Understand the applications of land-based machines and power units

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

CU28 Prepare for and maintain equipment and machines

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by Lantra SSC.

Assessment and grading

This unit will be assessed by:

- A range of assignments covering practical skills and underpinning knowledge.

Unit 328 Understanding Principles of Land-based Machinery

Outcome 1 Know the function of key components found in land-based machines and power units

Assessment Criteria

The learner can:

1. Identify **key components** used in land-based machines and power units
2. State the purpose of the **key components** of selected land-based machines and power units
3. Describe **operator adjustments** and **control systems** on selected land-based machines and power units

Unit content

Key components

Power units: engine components, lubrication and cooling systems, air supply and filtration, electrical systems
Mechanical power transmissions: gears, shafts, belts and pulleys, chains and sprockets, bearings, bushes, clutches, safety overload protection systems, power take off components and systems
Hydraulic systems: reservoirs, pumps, motors, filters, control valves and systems, oil cooling, pipes and fittings, pressure relief valves, pressure accumulators
Electrical systems: battery, fuses, generators, sensors, lighting, motors, cables and connections, auxiliary supply

Operator adjustments

Power unit: speed, power, economy
Mechanical power transmission: powers take off speeds and alignment, gear selection, belt and chain tensioning, clutch adjustment, overload protection adjustment
Hydraulic system: pressure and flow control, position, draft and mixture control, auxiliary connections and services, single and double acting supply, closed and open centre systems, mechanical and electrical control systems, pressure accumulation
Electrical systems: alternating and direct current, sensors, switches rheostats

Control systems

Operator ergonomics, position of controls, wheels, tracks, skids and flotation, steering systems, braking systems, differential locking, manual selection, automatic integration headland management, global positioning

Unit 328 Understanding Principles of Land-based Machinery

Outcome 2 Understand operating principles of land-based machines and power units

Assessment Criteria

The learner can:

1. Explain the operating principles of selected land-based machine **power unit** and **power transmission systems**
2. Compare the operating principles of the following systems to be found on land-based machines and power units
   - **2 stroke and 4 stroke power units**
   - AC and DC **electrical systems**
   - Closed and open centre **hydraulic systems**
3. Describe the operating principles and service requirements for a **liquid cooling system** and **air filtration system** to be found on a land-based machine power unit

Unit content

Power units

Engine rpm, fuel types, weight, fuel consumption, power torque, exhaust emissions

Power transmission systems

Vehicle transmissions, lines of drive, reduction gearbox, interchangeable sprockets and pulleys, variator drives slip clutch, chatter clutch, shear bolts

2 and 4 stroke engines

2 stroke cycle, four stroke cycle, fuel system, lubrication system (pressure lubrication, splash feed), turbo chargers

Electrical systems

Alternating current, direct current, voltage and current flow, simple circuits, fuse ratings, applications to land-based vehicles and hand operated electrical powered equipment, charging and generating system, solenoids , actuators

Hydraulic systems

Hydraulic circuits, reservoirs, pumps, motors, open and closed systems, oil cooler, flow and return filtration

Liquid cooling systems

Liquid and air-cooled systems, fans, pumps, thermostat, coolant, pressure caps, airflow, cowlings, guards

Air filtration systems

Pre-cleaners, cyclones, oil bath, filters, restriction warning system, unloader valves

Unit 328 Understanding Principles of Land-based Machinery

Outcome 3 Be able to undertake routine maintenance of land based machines and power units

Assessment Criteria

The learner can:

1. Carry out **risk assessments** in preparation for performing **routine maintenance** tasks on selected land-based machines and power units
2. Carry out routine maintenance, according to **manufacturers' recommendations** to a selected land-based machine
3. Complete **documentation to record maintenance tasks** carried out on a selected land-based machine

Unit content

Risk assessments

Health and safety and environmental protection, hazards, risks, control measures, safe use of tools, jacks, lifting equipment, power isolation, Health and Safety at Work etc Act 1974 (HASWA), Control of Substances Hazardous to Health (2002) (COSHH), Provision and Use of Work Equipment Regulations 1998 (PUWER), Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)

Routine maintenance

Pre-start checks, pre operation inspections, routine maintenance, recommended service procedures, correct use of service charts, operator manuals, lubricant data sheets

Manufacturers' recommendations

Time intervals, work intervals, recommended lubricants, correct filters, service procedure, adjustments, critical settings, warranty restrictions

Documentation to record maintenance tasks

Check list, job card, date of service, type of service, replacement components used , vehicle recognition, serial and registration numbers, future service due indication on machine

Unit 328 Understanding Principles of Land-based Machinery

Outcome 4 Understand the applications of land-based machines and power units

Assessment Criteria

The learner can:

1. Explain the **applications** of the **power unit**, **transmission** and **hydraulic system** on a selected land based machine
2. Discuss **operator settings** available on **power unit**, **transmission** and **hydraulic systems** when operating a land-based machine
3. Assess the effects on the **performance** of given land-based machines when changing operator settings on
   - Power unit
   - Transmission system
   - Hydraulic system
4. Evaluate **alternative designs** of the following systems adopted by different manufacturers
   - Power unit,
   - Transmission system
   - Hydraulic system

Unit content

Applications of the

Power unit: power, torque, fuel consumption, mobile and fixed applications, vehicles, generators
Transmissions: speed, ratios, torque requirements, traction
Hydraulic system: linkage, brakes, steering, power transmission operation, external supply

Operator settings

Power unit: speed (rpm)
Transmission: gear selection
Hydraulic system: position, draft, mixed and external services

Performance

Power unit: power, torque, fuel consumption, exhaust emissions
Transmission: traction, speed, travel direction, power take off speed
Hydraulic system: system pressure, flow rate, capacity, external services flow rate, motor speeds

Alternative designs

Power unit: cylinder number and configuration, turbocharged, capacity, spark ignition systems, type of fuel system/management

Transmission system: constant mesh, synchromesh, powershift, constantly variable transmissions, mechanical transmission clutch, fluid drive clutch, power drive clutch operation

Hydraulic system: open centred, closed centred, mechanical control, electro-hydraulic control, single/double acting external spool valves, fluid flow control

Unit 328 Understanding Principles of Land-based Machinery
Notes for guidance

This unit is designed to provide learners with knowledge and understanding of the working principles of a range of land-based power units and equipment to be found in their area of study. It will also allow learners the opportunity to carry out routine maintenance tasks to manufacturers' recommendations and specifications. At all times when practical tasks are carried out or assessed, an emphasis must be put on safe working practices and current legislations.

The range of machinery covered should include electric vehicles and machines if appropriate.

In Outcome 1, the learner will be required to investigate working principles of the range of engine types that power land based vehicles and machines. It is essential that the learner understands the limitations of engine types and why manufacturers designate their use to different purposes. The learners should be encouraged to develop understanding of topical issues regarding available fuel types, environmental pollution and running costs.

Outcome 2 prepares the learner for the knowledge and understanding required prior to undertaking practical maintenance work on engines and powered machines.
Emphasis should be directed to safe working practices, care of machines, tools and work areas. The learner should also be encouraged to develop forward thinking for the need for basic tool requirements which may be required on the work site where unscheduled maintenance tasks may have to be performed, hence the need for basic tools to be available on the vehicle or machine. Due to the complexity of modern vehicles and machines it is essential that learners understand that maintenance of machines and vehicles must be carried out to manufacturers recommendations and service documentation should be available and accurately followed when performing tasks.

In Outcome 3, the learner will be required to assess all risks to themselves, others, the environment and equipment prior to commencing practical tasks.
These risks should be recorded for future reference and appropriate control measures put in place and recorded against the risk.

The learner must be aware of current legislations and safe working practices and be encouraged to adopt a clean, tidy and methodical approach to work ethic and must be aware of consequences for his actions should the work carried out be responsible for injury or damage to a third party. The importance of completion of maintenance and work records must be highlighted as should the need for retrieval of those records from file for future reference particularly when assessing warranty claims, recurring failures or valuation on replacement.

Throughout the unit the emphasis will be on safe, legal practices, working to manufacturers' recommended procedures and attention to detail when recording information.

Depending on the land-based area the learner is studying, formal lecture delivery may be generic to all areas but practical experiences and learning should be appropriate to the area of study.

In Outcome 4, the learner will be able to explain how power unit speed can affect performance and efficiencies and explain how different engine types have different performance characteristics.

The learner will be able to demonstrate understanding of how power produced from the power unit can be distributed to a transmission system and hydraulic system to provide drives to propel a machine, provide mechanical and hydraulic drive to allow land-based machines to function.

The learner should be able to describe methods by which transmission settings can be used to control travel speeds and direction and by which hydraulic fluid speed and pressure settings affect performance of hydraulically driven and adjusted machines and equipment.

This Outcome requires learners to be able to compare a range of power units and machines from different manufacturers to evaluate alternative designs and systems that produce similar outcomes. It will, therefore, be necessary for learners to have access to a range of modern equipment for these comparisons and evaluations to be made.

References

Books

Bell B. 2005. *Farm Machinery*. Old Pond Publishing. ISBN 1903366682
Culpin C. 1992. *Farm Machinery, 12th edition*. Blackwell Scientific. ISBN 063203159X
Manufacturers publications and manuals

Journals

Horticultural Weekly
Profi International
Farmers Weekly

Websites

www.bagma.com	British Agricultural and Garden Machinery Association
www.defra.gov.uk	Dept for Environment, Food and Rural Affairs
www.wales.gov.uk	Welsh Assembly Government
www.scotland.gov.uk	Scottish Executive Environment and Rural Affairs Department
www.dardni.gov.uk	Department of Agriculture and Rural Affairs (Northern Ireland)
www.hse.gov.uk	Health and Safety Executive

Appendix 1 Relationships to other qualifications

Literacy, language, numeracy and ICT skills development

These qualifications include opportunities to develop and practise many of the skills and techniques required for success in the following qualifications:

- Functional Skills (England) – see www.cityandguilds.com/functionalskills
- Essential Skills (Northern Ireland) – see www.cityandguilds.com/essentialskillsni
- Essential Skills Wales - www.cityandguilds.com/esw

There might also be opportunities to develop skills and/or portfolio evidence if learners are completing any Key Skills alongside these qualifications.

Appendix 2 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.**

Providing City & Guilds qualifications – a guide to centre and qualification approval contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of learners
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Ensuring quality contains updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document contains information on:

- Management systems
- Maintaining records
- Assessment
- Internal verification and quality assurance
- External verification.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for learners who are eligible for adjustments in assessment.

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

- *Walled Garden*
  Find out how to register and certificate learners on line
- *Events*
  Contains dates and information on the latest Centre events
- *Online assessment*
  Contains information on how to register for GOLA assessments.

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Useful contacts

Type	Contact	Query
UK learners	T: +44 (0)84 4543 0033 E: learnersupport@cityandguilds.com	• General qualification information
Centres	T: +44 (0)84 4543 0000 F: +44 (0)20 7294 2413 E: centresupport@cityandguilds.com	• Exam entries • Registrations/enrolment • Certificates • Invoices • Missing or late exam materials • Nominal roll reports • Results
Walled Garden	T: +44 (0)84 4543 0000 F: +44 (0)20 7294 2405 E: walledgarden@cityandguilds.com	• Re-issue of password or username • Technical problems • Entries • Results • GOLA • Navigation • User/menu option problems
Employer	T: +44 (0)121 503 8993 E: business_unit@cityandguilds.com	• Employer solutions • Mapping • Accreditation • Development Skills • Consultancy

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

Published by
City & Guilds
1 Giltspur Street
London
EC1A 9DD

T +44 (0)84 4543 0000
F +44 (0)20 7294 2413
www.cityandguilds.com

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