SKILLEDTRADESBC

PROGRAM OUTLINE

Field Arborist

SKILLED TRADES BC

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FIELD ARBORIST

PROGRAM OUTLINE

APPROVED BY INDUSTRY

November 2010

Developed By
SkilledTradesBC
Province of British Columbia

SKILLED TRADES BC

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Section 1

INTRODUCTION

Field Arborist

FOREWORD

The Arboriculture Trade for British Columbia includes three distinct and progressive Apprenticeship Training Programs – Arborist Technician, Climbing Arborist and Field Arborist. The three separate Arboriculture Trade Provincial Certificates of Qualification (C of Q's) have been defined as follows:

Arborist Technician

In this entry level training the apprentice is primarily performing work on the ground or within 3 meters of the ground on ladders. Successful completion of training and assessments will result in Arborist Technician C of Q.

Climbing Arborist

In Climbing Arborist training the focus is on the climbing and technical skills used while working in trees. Successful completion of training and assessments will result in Climbing Arborist C of Q.

Field Arborist

The Field Arborist training covers the skills involved in advanced tree management, including: development of pest management plans, tree and site assessment and office management skills. Successful completion of training and assessments will result in Field Arborist C of Q.

Note 1: *The **Arborist Technician** and the **Climbing Arborist** Apprenticeship Training Programs recommend the apprentice obtain their Level 1 First Aid certification.*

Note 2: *Falling and Bucking is a separate endorsement from the Arboriculture Training Programs. The **Arborist Technician** technical training, as outlined in that program, covers the required knowledge and practical requirements of the **WorkSafeBC Faller Training Standard**.*

Note 3: *To obtain certification as a **Climbing Arborist** the Apprentice must successfully complete the **Climbing Arborist** Standardized Practical Assessment which may only be taken after successful completion of the Apprenticeship Training Program, the SkilledTradesBC written exam, and the required workplace hours.*

This Program Outline details the new **Field Arborist** Apprenticeship Training Program for British Columbia.

The Outline is to be used as a guide for all Instructors in classroom, field and work experience components of **Field Arborist** Apprenticeship Training Program. It also provides direction for the written and practical evaluations conducted during the technical training and workplace based training components of the program.

The Outline includes training provider standards, equipment and materials, and the facility requirements. The Outline is based on a 6 week training delivery program run with 1 Instructor and 16 students per class.

The development team for the **Field Arborist** Apprenticeship Training Program has collectively an extensive background in all arboriculture workplaces, including private sector climbing and consulting, municipal/urban tree management, utility arboriculture, and botanical gardens. Organizations and individual subject matter experts involved are listed on the proceeding pages.

Safety

The development team recognized that safety is of paramount importance in the arboriculture industry and that trained arborists are critical in ensuring workplace safety. It is imperative that arborists are aware of circumstances that may lead to injury to themselves, others, and surrounding trees or properties. It is generally recognized that a safety conscious attitude and work practices contribute to a healthy, safe and accident free working environment, and it is the responsibility of the Arborist to ensure the safety culture on the job site. It is imperative that Arborists are very familiar with and apply occupational health and safety rules and best practices as an integrated part of their job functions. As well, it is essential to identify hazards and take necessary measures to protect oneself, coworkers, the public, property, and the environment. The Program Outline provided incorporates safety as a thematic element through all competency areas, to reinforce the need and value of safe work practices in this trade.

Field Arborist Job Description

A Field Arborist is a certified tradesperson who is able to provide knowledge and expertise in arboricultural science and tree work, including, but not limited to:

- Tree Risk Assessments
- Arborist Reports/tree appraisals
- Planning and documentation for tree work projects
- Identifying tree pests and diseases and implementing pest management strategies
- Developing and implementing soil remediation strategies

This trade engages in a range of outdoor work activities in varying weather conditions.

Arborists work year round, however longer hours may be required in spring and summer or following storms and other weather emergencies.

To perform the work of a Field Arborist, the tradesperson must be able to:

- Interpret reference materials such as regulations and technical documentation
- Have knowledge of soil chemistry and tree biology
- Identify and diagnose common pests and diseases in woody plants and devise management plans to combat them
- Be able to initiate and support emergency response procedures from the ground
- Have effective written and verbal communication skills
- Manage jobs
- Train and mentor others

These workers may be employed by:

- Government departments dealing with environment, lands, and parks
- Institutions or facilities with extensive grounds (public and private)
- Private firms providing services in tree care and landscape management
- Utilities and private utilities contractors
- Tree nurseries
- Orchards
- Golf courses
- Private estates

General Aptitudes and Skills:

Field Arborists must enjoy working outdoors, have an interest in natural environments, trees and tree sciences. They must be physically fit and have good physical coordination. They must work well with minimal supervision and have good problem solving and critical thinking skills. They must have a high level of written and verbal communication skills.

Pre-requisites:

- Arborist Technician – Certificate of Qualification
- Climbing Arborist – Certificate of Qualification
- Ability to obtain driver's license
- Ability to obtain Level One First Aid

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

ACKNOWLEDGEMENTS

The Program Outline was prepared with the advice and direction of an industry steering committee convened initially by the HortEducationBC training organization. Members include:

- Kyle Banks — Davey Tree Expert Company of Canada
- Paul Buikema — Progress Landscaping
- Mark Brown — District of North Vancouver
- Thor Clausen — Arbortech Tree Services
- Heath Czypionka — City of Vancouver
- Rupert Evans — The Butchart Gardens
- Wes Hawley — Hawleyscape Tree Service Ltd.
- Clifford Hoegler — BC Plant Health Care Inc.
- Anne Kadwell — HortEducation BC
- Kerin Matthews — Mountain Maple
- Pat Perry — Davey Tree Expert Company of Canada
- Jason Timmis — Cedar Ridge Tree Care
- Gareth Tudor-Jones — Bartlett Tree Experts Company of Canada
- Noah Violini — Bartlett Tree Experts Company of Canada
- Bill Wilde — Arbor Vitae Tree Consultants

Industry subject matter experts retained to assist in the development of Program Outline content:

- Riel Aldred — Davey Tree Expert Company of Canada
- Dave Andermatt — Pacific Sun Tree Services
- Ken Bell — VanArbor Vegetation Consulting Ltd
- Craig Bench — Cypress Tree Service
- Mark Brown — District of North Vancouver
- Paul Buikema — Progress Landscaping
- Andrew Caines — City of Surrey
- Thor Clausen — Arbortech Tree Services
- Hud Elwood — Branching Out Tree Service
- Rupert Evans — The Buchart Gardens
- Reid Hardman — BC Plant Health Care
- Duncan Isberg — BC Hydro
- Ralph Nevill — District of North Vancouver
- Kerin Mathews — Mountain Maple
- Cory Manton — District of Saanich
- Dan Marzocco — City of Victoria
- Nick Perkins — Davey Tree Expert Company of Canada
- Chris Pardek — City of Port Coquitlam
- Pat Perry — Davey Tree Expert Company of Canada
- Aidon Pyne — Davey Tree Expert Company of Canada

- Brent Ritson — District of Saanich
- Ryan Senechal — Bartlett Tree Experts Company of Canada
- Trevor Smith — Arbor Pro Tree Services
- Amit Gandha — City of Vancouver Parks Board
- Jason Timmis — Cedar Ridge Tree Care
- Gareth Tudor-Jones — Bartlett Tree Experts Company of Canada
- Alex Thorburn — City of Richmond
- Blair Veitch — Davey Tree Expert Company of Canada
- Steve Whitton — City of Surrey
- Bill Wilde — Arbor Vitae Tree Consultants
- Russel Wilson — Davey Tree Expert Company of Canada

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SkilledTradesBC would like to acknowledge the dedication and hard work of these and other industry representatives in identifying the training requirements of the Field Arborist occupation.

HOW TO USE THIS DOCUMENT

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measureable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment

Section 2

PROGRAM OVERVIEW

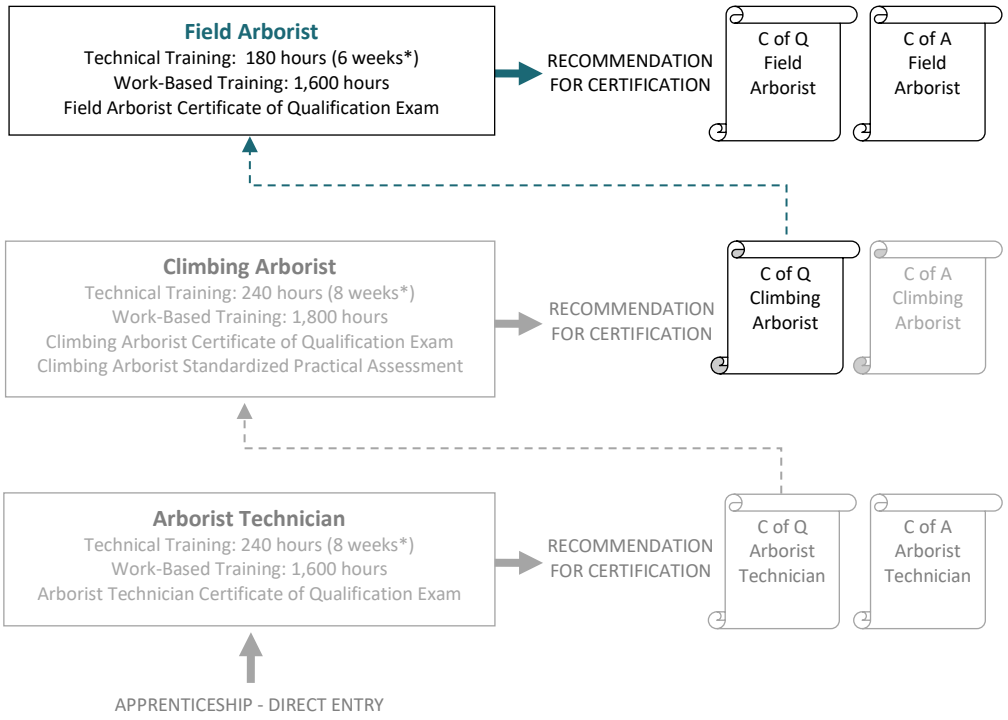
Field Arborist

PROGRAM CREDENTIALING MODEL

Apprenticeship Pathway

This graphic provides an overview of the Field Arborist apprenticeship pathway.

C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship



**Suggested duration based on 30-hour week*

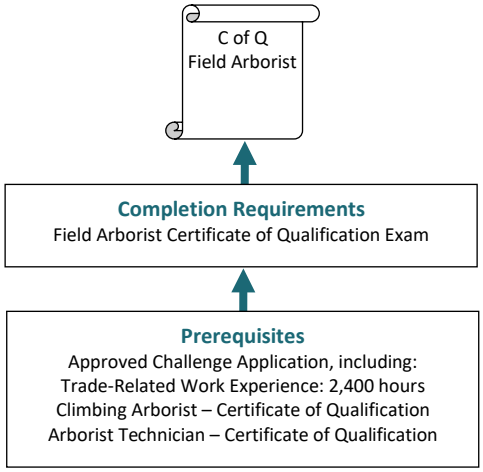
CROSS-PROGRAM CREDITS
Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None

Challenge Pathway

This graphic provides an overview of the Field Arborist challenge pathway.

C of Q = Certificate of Qualification



CREDIT FOR PRIOR LEARNING

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None

Occupational Analysis Chart

ARBORICULTURE TRADE – ARBORIST TECHNICIAN, CLIMBING ARBORIST & FIELD ARBORIST

Occupation Description: An Arborist is a certified tradesperson working in the Arboriculture trade. Arborists manage and maintain trees and shrubs in the urban forest, focusing on the health and safety of trees and the urban landscape. Typical duties include identifying trees and shrubs; pruning trees and shrubs (both on the ground and aloft); implementing Integrated Pest Management methods; and operating equipment such as chainsaws and chippers.

Regulations and Other Occupational Skills A	Identify relevant legislation and regulations A1	Explain Musculoskeletal Injury (MSI) and Repetitive Strain Injury (RSI) A2	Describe electrical systems and hazards A3	Identify work site hazards and develop and implement safe work plan A4	Apply regulations to the job site A5	Describe workplace leadership and communication A6
	1	1	1	1	2	2
	Write a variety of technical reports A7					
	3					
Power Equipment B	Use chipper in a safe and effective manner B1	Work safely and effectively on ground operations while using an aerial lift truck B2	Operate a single axle non-air brake dump truck B3	Operate a stump grinder B4	Work safely and effectively during aerial operations with aerial lift device B5	
	1	1	1	1	2	
Hand Tools and Small Power Tools C	Use and maintain hand tools C1	Operate a variety of small power tools C2	Use and inspect ladders C3			
	1	1	1			
Tree Work and Management D	Identify common trees in British Columbia D1	Identify common shrubs in British Columbia D2	Describe basic tree biology and its importance to good arboriculture practices D3	Safely prune trees to appropriate Industry standards D4	Safely prune shrubs to appropriate Industry standards D5	Safely plant trees to Industry standards D6
	1	1	1	1	1	1

	Identify common trees in British Columbia D7	Identify common stem and root crown diseases in British Columbia D8	Identify common woody plant pests and diseases in British Columbia D9	Assess trees on site D10	Perform appropriate actions to solve abiotic tree disorders D11	Safely prune trees to appropriate Industry standards D12
	2	2	2	2	2	2
	Select trees for site conditions D13	Structurally support trees D14	Identify common trees in British Columbia D15	Identify common quarantine pests of trees in Canada D16	Develop and implement integrated pest management plans for trees in urban setting D17	Diagnose and treat insects and diseases D18
	2	2	3	3	3	3
	Inspect, assess and identify a variety of risks to trees D19	Inventory trees D20	Preserve and retain trees D21	Examine tree value appraisal D22		
	3	3	3	3		
Falling and Bucking E	Demonstrate safe chain saw use E1	Describe and demonstrate the process of falling E2	Practice falling a tree E3	Manage falling hazards E4	Recognize hazardous weather conditions E5	Recognize dangerous falling practices E6
	1	1	1	1	1	1
	Identify special falling techniques E7	Plan for limbing and bucking E8				
	1	1				
Rigging F	Describe rigging concepts including selection and use of ropes F1	Select and use knots, hitches and slings in rigging F2	Use various types of hardware in rigging systems F3	Select and use friction control devices for rigging F4	Select and use appropriate rigging techniques F5	Perform cuts for various situations F6
	1	1	1	1	2	2
Climbing G	Select and inspect basic climbing gear G1	Conduct pre-climb assessment G2	Select and inspect climbing gear G3	Climb using various techniques G4	Conduct advanced post-climb job and gear inspection G5	
	1	2	2	2	2	

Emergency Response H	Evacuate worker H1	Review and describe First Aid certification requirements H2	Describe precautions and procedures to prevent and suppress fires H3	Implement spill response H4	Perform aerial rescue H6
	1	1	1	1	2
Job Planning and Risk Assessment I	Conduct site inspections. I1	Develop and communicate safe job plan I2	Conduct pre- job preparation I3	Ensure regulatory compliance I4	
	2	2	2	2	
Arboriculture Soil Science J	Examine soil chemistry and biology J1	Examine soil physics and hydrology J2	Develop and implement soil remediation strategies J3		
	3	3	3		

Occupational Analysis Chart

FIELD ARBORIST

Occupation Description: A “Field Arborist” is a certified tradesperson who prunes and performs other work of Climbing Arborists on trees from a ground and aerial situation, including climbing and aerial bucket work. In addition, Field Arborists develop and implement Integrated Pest Management and Plant Health Care plans, develop tree preservation strategies, inspect sites and trees for damage and hazards, perform job estimating, tree inventories, and tree appraisals. They also prepare reports in the technical areas described above and perform supervisory duties.

Line of Activity	Competency	Code	Level
Regulations and Other Occupational Skills (A)	Write a variety of technical reports	A7	3
Tree Work and Management (D)	Identify common trees in British Columbia	D15	3
	Identify common quarantine pests of trees in Canada	D16	3
	Develop and implement integrated pest management plans for trees in urban setting	D17	3
	Diagnose and treat insects and diseases	D18	3
	Inspect, assess and identify a variety of risks to trees	D19	3
	Inventory trees	D20	3
	Preserve and retain trees	D21	3
	Examine tree value appraisal	D22	3
Arboriculture Soil Science (J)	Examine soil chemistry and biology	J1	3
	Examine soil physics and hydrology	J2	3
	Develop and implement soil remediation strategies	J3	3

Training Topics and Suggested Time Allocation

FIELD ARBORIST

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line A	**Regulations and Other Occupational Skills**	**11%**	**80%**	**20%**	**100%**
A7	Write a Variety of Technical Reports		✓	✓	
Line D	**Tree Work and Management**	**67%**	**60%**	**40%**	**100%**
D15	Identify Common Trees in British Columbia		✓	✓	
D16	Identify Common Quarantine Pests of Trees in Canada		✓	✓	
D17	Develop and Implement Integrated Pest Management Plans for Trees in Urban Setting		✓	✓	
D18	Diagnose and Treat Insects and Diseases		✓	✓	
D19	Inspect, Assess and Identify a Variety of Risks to Trees		✓	✓	
D20	Inventory Trees		✓		
D21	Preserve and Retain Trees		✓	✓	
D22	Examine Tree Value Appraisal		✓	✓	
Line J	**Arboriculture Soil Science**	**22%**	**60%**	**40%**	**100%**
J1	Examine Soil Chemistry and Biology		✓	✓	
J2	Examine Soil Physics and Hydrology		✓	✓	
J3	Develop and Implement Soil Remediation Strategies		✓	✓	
	Total Percentage for Field Arborist	**100%**			

Section 3

PROGRAM CONTENT

Field Arborist

FIELD ARBORIST

Line A: A REGULATIONS AND OTHER OCCUPATIONAL SKILLS

Competency: A7 Write a Variety of Technical Reports

The Field Arborist will often write technical reports on a wide variety of arboriculture technical issues.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	3

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to accurately and efficiently write technical reports on a wide variety of technical arboriculture subjects, according to Industry standards.

LEARNING TASKS	CONTENT

1. Examine the requirement for writing an Arborist report	• Elements of a booklet style report:
	  ○ Summary
	  ○ Introduction:
	  – Background
	  – Assignment
	  – Limits of assignment
	  – Purpose and use of report such as:
	  ▪ Identify trees with high hazard risks
	  ▪ Prioritize hazard tree mitigation work
	  ▪ To accompany a building permit application
	  ▪ Others
	  ○ Observations
	  ○ Analysis
	  ○ Discussion
	  ○ Conclusions
	  ○ Recommendations
	  ○ Supporting information
	  ○ Assumptions and limiting conditions
	  ○ Qualifications of author
	• Common topics contained within Arborist reports may include:
	  ○ Tree valuation
	  ○ Damage assessment
	  ○ Tree risk assessment
	  ○ Accident investigations
	  ○ Tree inventory
	  ○ Plant health care assessments
	  ○ Tree mitigation prescriptions
	  ○ Tree preservation plans

2. Write and edit technical reports	• Spelling • Grammar

- Punctuation
- Footnoting
- Bibliographies
- Four C's – clear, concise, complete, and correct
- Proof reading
- Editing
- Articles
- Copyrights and protecting intellectual property

3. Draft routine business correspondence

- Memos
- Letters
- E-mails
- Contract documents
- Tenders, RFQs and RFPs
- Quotations and proposals

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on writing a variety of technical reports, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Requirements for writing an Arborist report
2. Writing and editing technical reports
3. Drafting routine business correspondence

Performance evaluation

Performance — The apprentice should be able to write a report:

1. Utilizing appropriate report format
2. Using correct spelling, grammar, punctuation, footnotes and bibliographies (if used)
3. Including sufficient technical content
4. Demonstrating a clear understanding of topic

Conditions — Given a real site scenario.

LINE D: D TREE WORK AND MANAGEMENT

Competency: D15 Identify Common Trees in British Columbia

A Field Arborist has a working knowledge of a variety of different tree species and can identify them using a variety of different methodologies. They use this knowledge to make decisions on a variety of arboriculture tasks, such as promoting plant health pruning, site selection, and disease and pest management.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	5

Objectives:

To be competent in this area, the individual must be able to:

- Have working knowledge of a variety of different tree species and identify them using a variety of different methodologies, according to Industry standards.

LEARNING TASKS	CONTENT
1. Identify trees during all seasons of the year	• Binomial nomenclature and general tree taxonomy to Family
2. Describe the characteristic parts of trees to help correctly identify them	• Morphological characteristics of a variety of common trees, including buds, leaf scar, stems, bark, inflorescences, leaf arrangement and growth habit
3. Use of dichotomous keys for field study purposes	• Common trees of British Columbia including conifer and deciduous dichotomous key for tree identification

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on identifying common trees in British Columbia, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Identify common trees
2. Describe growth habit
3. Describe morphological characteristics
4. Match tree species to site conditions

Performance evaluation

Performance	The apprentice should be able to correctly identify 20 woody plants (at Instructor's discretion and / or as availability dictates).
Conditions	Given samples of twigs, leaves and or photos.

LINE D: D TREE WORK AND MANAGEMENT

Competency: D16 Identify Common Quarantine Pests of Trees in Canada

The Field Arborist will regularly have to identify common and uncommon plant pests, including quarantine pests in trees. This is an important task as pests can increase risk while in the trees, and the Field Arborist must make decisions on effective means to deal with pest issues and report any findings of quarantine pests to the Canadian Food Inspection Agency.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	2

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to identify common quarantine pests of trees in Canada, according to Industry standards and the authorities having jurisdiction.

LEARNING TASKS

1. Identify quarantine pests for Canadian trees

CONTENT

- Most common quarantine pests of trees based on the most up to date list as published by the Canadian Food Inspection Agency (CFIA), including but not limited to:
  - Gypsy moths
  - Asian long-horn beetle
  - Emerald Ash borer
  - Brown spruce beetle
  - European and Asian gypsy moth
  - Hemlock woolly adelgid (HWA
    red-belted clearwing moth
    [Synanthedon myopaeformis])
  - Pale Tussock moths
  - Dutch Elm disease
  - Oak Wilt
  - Phytophthora ramorum (Sudden Oak Death)
- Refer to updated CFIA list

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on identifying common quarantine pests of trees of Canada, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Identify pests, signs and symptoms
3. Identify quarantine pests

Performance evaluation

Performance	The apprentice should be able to identify eight appropriate pest damages to plant material (at Instructor's discretion and/or as availability dictates).
Conditions	Given a variety of samples.

LINE D: D TREE WORK AND MANAGEMENT

Competency: D17 Develop and Implement Integrated Pest Management Plans for Trees in Urban Setting

The Field Arborist is regularly responsible for developing Integrated Pest Management Programs to promote and support plant health.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
4	2

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to develop, implement and evaluate integrated pest management plans for urban arboriculture settings, according to Industry standards and the authorities having jurisdiction.

LEARNING TASKS	CONTENT
1. Explain the principles of Plant Health Care	• The relationship between tree care practices (including plant and site selection, site prep, planting and establishment care, managing nutrient, water and soil aeration, pruning, pest and disease management, monitoring for plant growth, preventing or mitigating plant problems) and plant pests • Key plants, pests and stresses in local area • IPM as a management approach
2. Explain Integrated Pest Management	• The elements of IPM Prevention: o Identification o Monitoring o Action thresholds o Treatments o Evaluation
3. Identify the steps in developing an IPM Plan	• Steps in an IPM Plan: o Identify pests o Develop plan o Implement plan o Ensure and obtain regulatory compliance

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on developing and implementing integrated pest management plans for trees in urban settings, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Principles of Plant Health Care
2. Integrated Pest Management
3. Steps in developing an IPM Plan

Performance evaluation

Performance	The apprentice should be able to develop an appropriate IPM Plan including documentation for regulatory compliance.
Conditions	Given a scenario.

Performance	The apprentice should be able to accurately identify and fill gaps utilizing best practices.
Conditions	Given an incomplete case study.

LINE D: D TREE WORK AND MANAGEMENT

Competency: D18 Diagnose and Treat Insects and Diseases

The Field Arborist will occasionally have to diagnose and treat tree disorders that result from a variety of fungi, parasitic plants and insects.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
4	2

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to identify, diagnose and treat insects and diseases, according to Industry standards.

LEARNING TASKS

1. Diagnose insects and diseases

CONTENT

- Insects:
  - Bronze Birch Borer
  - Cherry Bark Tortrix
  - Pine Bark Beetles
  - Aphids
  - Adelgids
  - Scales
  - Leaf Miner
  - Tent Caterpillars
  - Fall Webworm
  - Douglas Fir Silver Spotted Tiger Moth
  - Sawfly
  - Others
- Diseases:
  - Phytophthora ramorum (Sudden Oak Death)
  - Root Diseases
  - Anthracnose
  - Wilt
  - Powdery Mildew
  - Fire Blight
  - Armillaria
  - Laminated Root Rot
  - White Butt Rot
  - Hardwood Trunk Rot
  - Butt Rot
  - Silver Leaf Disease
  - Phomopsis
  - Cytospora
  - Nectria
  - Mistletoe
  - Keithia blight
  - Others

2.	Determine threshold levels	• Economic and aesthetic losses based on each species

3.	Determine control options	• IPM model:
		  ○ Reference tree profiles
		  ○ Regulatory controls
		  ○ Genetic controls
		  ○ Biological controls
		  ○ Cultural controls
		  ○ Chemical controls

4.	Implement treatment options	• Variety of tree treatment options for insects and diseases:
		  ○ Remove
		  ○ Replace
		  ○ Monitor
		  ○ Treat

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on diagnosing and treating biotic woody plant disorders, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Plant growth and development
2. Pests and disease control

Performance evaluation

Performance — The apprentice should be able to:

- Develop an IPM Program for a common insect problem including:
  - Analyze site and conduct an assessment:
    - Obtain background information
  - Action decisions:
    - Identification
    - Monitoring
    - Action thresholds
    - Treatments
    - Evaluation

Conditions — Given a variety of samples.

LINE D: D TREE WORK AND MANAGEMENT

Competency: D19 Inspect, Assess and Identify a Variety of Risks to Trees

The Field Arborist will inspect trees and sites to determine damage to trees and develop and implement plans to manage risks associated with trees.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	4

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to inspect trees and assess damage to trees and identify risks associated with trees, according to Industry standards and the authorities having jurisdiction.

LEARNING TASKS

1. Identify components that comprise tree risk and assessment

CONTENT

- Tree structure
- Environment and target
- Variety of tree damage:
  - Pruning
  - Construction
  - Storm
  - Improper cutting
- Branch, trunk and root defects leading to failure including – decay, poor attachment, co-dominance, root removal, tree mechanics
- External indicators:
  - Cracks
  - Ribs
  - Bulges
  - Abnormal bark patterns
- Aggravating site and tree conditions including:
  - Taper
  - Weak attachments
  - Wind
  - Snow load
  - Soil saturation and depth
  - Grading changes
  - Restricted root zones and infrastructure conflicts (buildings, sidewalks)
  - Lean
  - Crown asymmetry
  - Recent exposure

2.	Perform a site inspection	• Soil characteristics • Elevation • Topography • Construction damage • Wind exposure and damage to trees • Development constraints

3.	Explain methods of decay detection	• Non-invasive tree assessment including:
		  ○ Visual
		  ○ Mallet tests
		  ○ Ground penetrating radar
		  ○ Probing
		• Invasive tests including but not limited to:
		  ○ Increment borers
		  ○ Drilling
		  ○ Micro drills (e.g. Resistographs)
		  ○ Acoustic measurements
		  ○ Culturing
		  ○ Electrical resistance
		  ○ Root crown excavation

4.	Develop mitigation strategies	• Variety of mitigation strategies
5.	Describe tree risk management programs	• Assessing vs. managing risk abatement: moving target • Pruning • Cabling • Bracing • Modifying site conditions or tree removal

6.	Create tree protection zones	• Factors to create root protection zones, methods for creating root protection zones including:
		  ○ Closures
		  ○ Barricading
		  ○ Fencing
		  ○ Hoarding
		  ○ Signage

7.	Develop a risk management plan	• Prioritization of risk within the plan

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on inspecting, assessing and identifying a variety of risks to trees, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Tree structure, environment and target
2. Branch, trunk and root defects leading to failure
3. Decay, poor attachment, co-dominance, root removal, tree mechanics
4. Cracks, ribs, bulges, abnormal bark patterns
5. Taper, weak attachments, wind, snow load, soil saturation and depth, grading changes, restricted root zones and infrastructure conflicts (buildings, sidewalks), lean, crown asymmetry, recent exposure
6. Soil characteristics, elevation, topography, construction damage, wind exposure and damage to trees; development constraints
7. Managing risk
8. Risk abatement: moving target, pruning, cabling, bracing, propping, modifying site conditions or tree removal
9. Factors affecting safe work zone, methods for creating safe work zones: closures, barricading, fencing, hoarding

Performance evaluation

Performance — The apprentice should be able to:

1. Properly use tools and equipment
2. Identify tree characteristics that could lead to tree decline and/or failure
3. Identify site characteristics that could lead to tree decline and/or failure
4. Develop risk management plan

Conditions — Given a field situation involving five to ten trees.

LINE D: D TREE WORK AND MANAGEMENT

Competency: D20 Inventory Trees

The Field Arborist will carry out tree inventories to locate and determine the species, size and, condition.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
4	4

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to carry out tree inventories on a wide variety of sites, according to Industry standards.

LEARNING TASKS	CONTENT
1. Perform a tree inventory	• General overview of the trees describing species composition, diameter distribution, age class and condition at a stand or individual tree level
2. Survey trees in development or other specific site	• Identify and record tree species and characteristics
3. Locate trees on scaled plans	• Plotting center line of trunk using baseline, direct or triangulation measurements, drip line, base elevation, and corresponding tree inventory number

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on inventorying trees, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to techniques to:

- Record tree species or lowest possible taxonomic level
- Size including trunk diameter, tree height and canopy spread, plant health, form and structure crown class, live crown ratio and crown integrity

LINE D: D TREE WORK AND MANAGEMENT

Competency: D21 Preserve and Retain Trees

The Field Arborist will develop and implement plans to preserve and retain trees.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	2

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to develop and implement plans to preserve and retain trees on a wide variety of sites, according to Industry standards.

LEARNING TASKS	CONTENT
1. Identify goals of tree preservation	• Value of trees • Respect tree growth patterns and development • The land development process
2. Explain the steps of tree preservation process	• Conduct a tree survey/inventory • Identify trees for preservation • Assess potential impacts to trees in development plans • Suggest modifications to development plans
3. Determine tree protection zones	• Evaluate species tolerance to disturbance • Assess construction impacts • Root and crown conformations
4. Identify tree work needed prior to site clearing and grading	• Identify tree work needed prior to site clearing and grading
5. Prepare written specification for tree preservation	• Written requirements for what work will be performed and how it is to be executed
6. Monitor trees during construction	• Including establishing critical protection zones • Respond to design changes, evaluate protection strategies and measures
7. Prepare a post-construction maintenance plan	• Cultural maintenance treatments to support tree health

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on preserving and retaining trees, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Identify trees for preservation
2. Assess potential impacts to trees in development plans
3. Evaluate species tolerance to disturbance
4. Assess construction impacts
5. Root and crown conformations

Performance evaluation

Performance
The apprentice should be able to write a report including:

1. Conduct a tree survey/inventory
2. Identify trees for preservation
3. Assess potential impacts to trees in development plans
4. Suggest modifications to development plans
5. Evaluate species tolerance to disturbance, assessing construction impacts, root and crown conformations

Conditions
Given a site situation.

LINE D: D TREE WORK AND MANAGEMENT

Competency: D22 Examine Tree Value Appraisal

The Field Arborist may appraise the value of trees in urban landscapes.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
2	1

Objectives:

To be competent in this area, the individual must be able to:

- Learn tree appraisal techniques, according to Industry standards.

LEARNING TASKS	CONTENT
1. Identify purposes for tree appraisals	• Insurance valuation or claims • Wrongful loss • Property valuation • Value of urban forest

2. Identify appraisal tools	• Accepted industry methodology e.g. :
	  ○ Replacement cost methods
	  ○ Trunk formula method
	  ○ Cost of cure
	  ○ Crop value
	  ○ Amenity tree valuation

3. Assess factors affecting the value of plants	• Species • Size • Location • Condition
4. Explain condition ratings	• Describe weighted characteristics of structural integrity and tree health

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on appraising the value of trees, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Insurance valuation or claims
2. Wrongful loss
3. Property valuation
4. Value of urban forest
5. Replacement cost methods
6. Compounded replacement formula
7. Trunk formula method, cost of care
8. Cost of cure, crop value
9. Amenity tree valuation
10. Weighted characteristics of structural integrity and tree health

Performance evaluation

Performance — The apprentice should be able to develop two tree appraisals based on information including:

1. Species
2. Species rating
3. Adjusted trunk appraisal ratings
4. Condition
5. Location ratings
6. Calculations based on given formulas

Conditions — Given a real site situation.

LINE J: J ABORICULTURE SOIL SCIENCE

Competency: J1 Examine Soil Chemistry and Biology

The Field Arborist will often have to collect soil samples, understand basic soil chemistry, and biology. A Field Arborist will also interpret soil analysis reports.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	2

Objectives

To be competent in this area, the individual must be able to:

- Demonstrate the ability to interpret soil chemical properties, according to Industry standards.

LEARNING TASKS	CONTENT
1. Examine the relationship between soil texture and chemistry	• Soil texture and soil organic matter and their relationship to soil chemistry
2. Examine soil cation exchange capacity	• Soil factors that influence CEC
3. Examine soil pH and Electrical Conductivity (EC)	• Soil acidity, salinity and sodicity
4. Measure soil pH and EC	• Field methods for measuring soil pH and EC
5. Discuss modifying soil pH, salinity and sodicity	• Methods of modifying soil pH, salinity and sodicity
6. Examine macro and micro nutrients and their relationship to plant growth	• Macro and micronutrients and their role in plant growth and health
7. Examine basic soil biology	• Soil microorganisms
8. Determine fertility requirements	• Determine fertilizer requirements based on soil analysis reports
9. Sample soils	• Soil sampling techniques
10. Select appropriate plants based on soil chemical properties	• Practical application of plants and soil chemistry

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on knowledge of soil chemistry and biology, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Cation exchange capacity
2. pH
3. Salinity
4. Sodicity
5. Macronutrients
6. Micronutrients
7. Soil sampling
8. Amending soil
9. Plant selection based on soil chemistry

Performance evaluation

Performance	The apprentice should demonstrate proper soil sampling techniques.
Conditions	In a field situation.

NOTE: The performance evaluations for J-1, J-2 and J-3 have been combined and will be covered off on one Practical Assessment Form within the Instructor Manual.

LINE J: J ARBORICULTURE SOIL SCIENCE

Competency: J2 Examine Soil Physics and Hydrology

The Field Arborist will often have to collect and review data on soil hydrology, drainage and compaction as it impacts tree health.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	2

Objectives:

To be competent in this area, the individual must be able to:

- Demonstrate the ability to interpret soil physical properties and apply to plant health and site conditions, according to Industry standards.

LEARNING TASKS	CONTENT
1. Examine the origins of soils	• Soil profiles and horizons • Soil mineral fractions and soil organic content

2. Examine soil porosity, aeration capacity and hydraulic conductivity	• Influence of soil physical properties on:
	  ○ Porosity
	  ○ Aeration
	  ○ Hydraulic conductivity

3. Examine surface and sub-surface drainage	• Surface and subsurface drainage techniques
4. Examine impact of soil compaction on soil physical properties and plant growth	• Role of soil moisture and texture on soil compaction
5. Examine causes of soil compaction	• Vehicle and pedestrian traffic impact on soil compaction • Soil compaction impacts on tree growth • Methods of measuring soil compaction
6. Examine methods for mitigating soil compaction	• Vertical mulching / radial trenching • Root crown excavation (air assisted) • Mulch entire root zone • Core aeration

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on soil physics and hydrology, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Soil texture
2. Soil porosity
3. Soil hydraulic conductivity
4. Soil compaction
5. Soil drainage

Performance evaluation

Performance The apprentices should demonstrate the ability to interpret soil physical properties and apply

	to plant health and site conditions.
Conditions	Given a real site situation.

NOTE: The performance evaluations for J-1, J-2 and J-3 have been combined and will be covered off on one Practical Assessment Form within the Instructor Manual.

LINE J: J ARBORICULTURE SOIL SCIENCE

Competency: J3 Develop and Implement Soil Remediation Strategies

The Field Arborist will review soil data and develop soil management and remediation plans for a variety of urban sites.

Importance 1 (minimally) to 5 (extremely)	Frequency of use 1 (rarely) to 5 (daily)
5	2

Objectives:

To be competent in this area, the individual must be able to:

- Interpret soil reports.
- Develop a site remediation plan with methods to improve tree/plant health and survival.

LEARNING TASKS	CONTENT
1. Interpret soil reports	• Interpretation of physical and chemical information from soil reports
2. Develop a site remediation plan with methods to improve tree/plant health and survival	• Soil analysis (if required) • Site remediation methods to alleviate problems • Written report

Achievement Criteria:

Theoretical evaluation

Given a series of multiple-choice questions on developing and implementing soil remediation strategies, the apprentice will demonstrate knowledge by correctly answering the questions with a minimum achievement of 70%.

Evaluation content to include, but not limited to:

1. Soil texture
2. Developing a site remediation plan with methods to improve tree/plant health and survival

Performance evaluation

Performance The apprentices will develop a site remediation plan.

Conditions Given a real site situation.

NOTE: The performance evaluations for J-1, J-2 and J-3 have been combined and will be covered off on one Practical Assessment Form within the Instructor Manual.

Section 4

TRAINING PROVIDER STANDARDS

FACILITY REQUIREMENTS

Field Arborist Apprenticeship Training Facilities must have a comfortable classroom space and a training area for practical assignments capable of facilitating 16 students including:

- Internet access
- Library resources
- Laboratory facilities for pest, entomology, and diseases
- Soils laboratory and access to sites to observe soils in the field
- Storage facility for tools and equipment
- Workshop area for tool maintenance

REQUIREMENT/GUIDELINES FOR SPECIFIC GENERAL AREA OF COMPETENCIES:

D – Tree Work and Management

- Access to a large range of plant material common to the area

TOOLS AND EQUIPMENT

The apprentices must provide their own Personal Protective Equipment as well as the following list of hand and small power tools:

- Binoculars
- Calculator
- Camera
- Compass
- Core sampler
- DBH tape
- Clinometer
- Increment borer
- Measuring tape
- Magnifying glass x 10
- Mini-mattock
- Secateurs / pocket knife
- Sounding mallet

Material and equipment list for the Training Provider is based on a class of 16 apprentices with one Instructor. Where applicable, equipment may be rented for instructional purposes.

Hand and Small Power Tools

1 – Air excavation tool and compressor
4 – Cordless drill and small bits
4 – EC meter
4 – GPS
2 – Microscopes
2 – Penetrometers
4 – pH meter
1 – Resistograph
16 – Sample jars
8 – Shovel
8 – Soil probes

Materials

Examples/case studies which may include:

- Maps
- Site plans
- Pictures
- Tree survey
- On and off site civil engineering plans, etc.
- Office equipment including computers
- Pictures
- Samples (twigs, leaves, photos/illustrations)
- Soil analysis
- Soil samples
- Species rating book (current addition)
- Projector
- Water resistant paper

REFERENCE MATERIALS

Required Resources for Apprentices:

- *Arborist Technician Apprenticeship Training Program – Apprentice Manual*
- *Climbing Arborist Apprenticeship Training Program – Apprentice Manual*
- *Field Arborist Apprenticeship Training – Apprentice Manual*
- *Arboriculture: Integrated Management of Landscape Trees, Shrubs, and Vines, 4th edition,* Harris, Clark and Matheny, Prentice Hall, 2004
- *BC Landscape Standard*, 7th Ed, BCLNA and the BCSLA, 2008
- *Common Tree Diseases of British Columbia,* Eric Allen, Duncan Morrison and Gordon Wallis, Natural Resources Canada, Canadian Forest Service, 1996
- *Trees in Canada*, John Farrar, Fitzhenry & Whiteside Publishing, 1995
- *Writing Effective Reports,* American Society of Consulting Arborists, 2004

Required Resources for Instructors:

- *Arborist Technician Apprenticeship Training Program – Apprentice Manual*
- *Climbing Arborist Apprenticeship Training Program – Apprentice Manual*
- *Field Arborist Apprenticeship Training – Apprentice Manual*

Additional Resources:

- *American National Standard for Arboricultural Operations – Pruning Standard*, ANSI A300 – 2001 (Part 1)
- *American National Standard for Arboricultural Operations – Fertilization Standard*, ANSI A300 – 2004 (Part 2)
- *American National Standard for Arboricultural Operations – Supplemental Support Systems*, ANSI A300 – 2006 (Part 3)
- *American National Standard for Arboricultural Operations – Lightning Protection Systems*, ANSI A300 – 2008 (Part 4)
- *American National Standard for Arboricultural Operations – Management of Trees and Shrubs During Site Planning, Site Development, and Construction*, ANSI A300 – 2005 (Part 5)
- *American National Standard for Arboricultural Operations – Transplanting*, ANSI A300 – 2005 (Part 6)
- *American National Standard for Arboricultural Operations – Integrated Vegetation Management (IVM)*, ANSI A300 – 2006 (Part 7)
- *Green Industry Standards Dictionary 2009-2010*

- *2007 Species Ratings for Landscape Tree Appraisal*, ISA press (PNW chapter)
- *A New Tree Biology Dictionary*, Alex L. Shigo, Shigo and Trees, Associates, 1986
- *A Photographic Guide to the Evaluation to Trees in the Urban Environment*, Nelda Matheny and James R. Clark, 2004
- *Arboriculture and the Law in Canada*, Dunster and Murray
- *Arborists' Certification Study Guide,* ISA Publication
- *Evaluating Tree Defects, Field Guide*, Ed Hayes, 2nd edition
- *Diseases of Trees and Shrubs*, Lyons, Sinclair et al,, Cornell Press
- *Fungal Strategies of Wood Decay in Trees*, Schwarze, Engels and Mattheck
- *Guide for Plant Appraisal,* Council of Tree and Landscape Appraisers, 9th edition
- *Guide to Report Writing For Consulting Arborists,* ISA press
- *Hardy Trees and Shrubs: An Illustrated Encyclopedia*, Dirr, Michael, Timber Press, 2009
- *Insects That Feed on Trees and Shrubs*, Sinclair, Lyons et al,, Cornell Press
- *Manual of Woody Landscape Plants, 9th edition*, Michael A. Dirr, Stipes Publishing Co., 2009
- *Native Trees of BC*. Halter, Reese & NJ Turner, Crown Publication, 2003
- *Photographic Guide to the Evaluation of Hazard Trees in Urban Areas,* Nelda Matheny and James R. Clark
- *Principles and Practices, Soil Science,* 3rd edition, Washington
- *Species Ratings for Landscape Tree Appraisal,* Pacific Northwest Chapter of the International Society of Arboriculture
- *The Organic Gardener's Handbook Of Natural Insect And Disease Control*, Rodale press
- *The Random House Book Of Trees Of North America And Europe: A Photographic Guide To More Than 500 Trees*, Roger Phillips
- *Trees and Development*, Nelda Matheny and James R. Clark
- *Trees and Development: A Technical Guide to Preservation of Trees During Land Development,* Nelda Matheny and James R. Clark
- *Up by Roots,* James Urban

Website Resources:

- A Tree Story
  http://www.youtube.com/watch?v=5-_GUggGMmM&feature=player_embedded#!
- Arbor Rigging Operations
  http://www.arbormaster.com/uploads/ArborMaster%20Articles/Arborist%20Rigging%20Operations.pdf
- BC Forest Safety Council
  http://www.bcforestsafe.org/training/faller_certification/resources.html
- BC Faller Training Standard, *InfoFlips*
  - Part one
    https://www.worksafebc.com/en/resources/health-safety/books-guides/bc-faller-training-standard/part-1?lang=en
  - Part Two
    https://www.worksafebc.com/en/resources/health-safety/books-guides/bc-faller-training-standard/part-2?lang=en
- BC Hydro
  https://www.bchydro.com/safety-outages/worker-training/safety-resources.html
- BC One Call
  http://www.bconecall.bc.ca
- BC Provincial Emergency Program
  http://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery
- British Columbia IPM Regulations
  http://www.bclaws.ca/civix/document/id/complete/statreg/604_2004
- British Columbia Motor Vehicle Act and other statutes and regulations
  http://www.bclaws.ca/civix/document/id/complete/statreg/96318_00
- BC Ministry of Environment (MOE)
  http://www.env.gov.bc.ca/wld/
- British Columbia Outdoor Wilderness Guide –The Trees of British Columbia
  http://bcadventure.com/adventure/wilderness/forest/
- British Columbia Workers Compensation Act
  http://www.bclaws.ca/Recon/document/freeside/--%20w%20--/workers%20compensation%20act%20rsbc%201996%20c.%20492/00_act/96492_00.htm
- Canadian Environmental Protection Act
  http://www.ec.gc.ca/alef-ewe/default.asp?lang=En&n=2140D763-1
- Canadian Food Inspection Agency
  http://www.inspection.gc.ca/eng/1297964599443/1297965645317
- Canadian System of Soils Classification
  http://sis.agr.gc.ca/cansis/taxa/cssc3/index.html
- Commercial Vehicle Safety and Enforcement (CVSE)

http://www.th.gov.bc.ca/cvse/

- E-Flora – Electronic Atlas of Plants of British Columbia
  http://ibis.geog.ubc.ca/biodiversity/eflora/
- Fisheries Act
  http://laws-lois.justice.gc.ca/eng/acts/F-14/
- Insurance Corporation of BC
  http://www.icbc.com
- Ministry of Forest and Range – Tree Book: Learning the Trees of British Columbia
  http://www.for.gov.bc.ca/hfd/library/documents/treebook/
- Ministry of Transportation and Infrastructure, *Traffic Control Manual for Work on Roadways*
  http://www.th.gov.bc.ca/publications/eng_publications/TCM/Traffic_Control_Manual.htm
- Pest Management Regulatory Agency
  http://www.hc-sc.gc.ca/ahc-asc/branch-dirgen/pmra-arla/index-eng.php
- Provincial Regulations
  http://www.bclaws.ca/
- Rigging Knots
  http://www.arbormaster.com/Rigging%20Knots.pdf
- TDG
  https://www.tc.gc.ca/eng/tdg/clear-menu-497.htm
- Traffic Control Manual for Work on Roadways
  http://www.th.gov.bc.ca/publications/eng_publications/TCM/Traffic_Control_Manual.htm
- Tree Care Industry Association (TCIA)
  http://tcia.org/
- Wildlife Act
  http://www.bclaws.ca/Recon/document/ID/freeside/00_96488_01
- WorkSafeBC
  http://www.worksafebc.com
- WorkSafeBC First Aid Certification
  http://www2.worksafebc.com/topics/firstaid/home.asp
- WorkSafeBC OHS Guidelines http://www2.worksafebc.com/publications/OHSRegulation/Home.asp
- WorkSafeBC OHS Guidelines, Limits of Approach Part 19
  http://www2.worksafebc.com/publications/OHSRegulation/GuidelinePart19.asp#SectionNumber:G19.9
- WorksSafeBC OHS Guidelines, Forestry Operations and Similar Activites
  https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-guidelines/guidelines-part-26

- WorkSafeBC, *Working Safely Around Electricity*
  http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/electricity.pdf

NOTE:

This list of Reference Materials is for training providers. Apprentices should contact their preferred training provider for a list of recommended or required texts for this program.

INSTRUCTOR REQUIREMENTS

Occupation Qualification

The instructor must possess:

- Field Arborist - Certificate of Qualification

Work Experience

A minimum of 5 years trade experience in at least 75% of the General Areas of Competency.

Instructional Experience and Education

- Instructors must have a Provincial Instructor's Diploma Program or be registered in the Program

OR

- Hold a Bachelors or Master's degree in Education

INSTRUCTOR(S) FOR SPECIFIC GENERAL AREAS OF COMPETENCY:

A – Regulations and Other Occupational Skills

- Diploma in management or a combination of education and experience
- 5 years experience in a related field
- Minimum of 5 years practical supervisory experience

J – Arboriculture Soil Science

- Diploma in Horticulture or a combination of education and experience
- 5 years experience in a related field

Appendices

Appendix A

Glossary

ARBORICULTURE TRADE GLOSSARY

3-strand rope – type of rope construction in which three strands are twisted together

7-strand rope, common-grade cable – type of cable, often used to cable trees

12-strand rope – braided rope construction used for climbing and rigging lines; the 12-strand construction is not easily spliceable

16-strand rope – braided rope construction with a cover and a core

abiotic disorders – plant problems caused by non-living agents

abscissic acid – plant growth substance that triggers leaf or fruit drop

abscission – leaf or fruit drop

abscission zone – area at the base of the petiole where cellular breakdown leads to leaf drop

absorbing roots – fine, fibrous roots that take up water and minerals; most of them are within the top 12 inches (30 centimeters) of soil

absorption – taking up

access line – a second climbing line hung in a tree as a means of reaching a victim in an emergency

access route – means of entering and leaving a property during a construction operation

acclimation – process by which plants and other living organisms adapt physiologically to a climate or environment different than their own

acuminate – leaf shape having an apex the sides of which are gradually concave and taper to a point

acute – disorder or disease that occurs suddenly or over a short period of time

adaptability – genetic ability of plants and other living organisms to adjust or accommodate to different environments

adpressed – in close, tight proximity

adventitious bud – bud that arises from a place other than a leaf axil

aeration – provisions of air to the soil to alleviate compaction and improve its structure

aeration system – the set of holes or trenches created in a tree's root area to improve oxygen availability to the roots

aerial device – truck with booms and bucket used to place a worker in proximity of to a tree's crown

aerial rescue – method used to bring an injured worker down from a tree or aerial lift device

aesthetic – artistic or pleasing characteristics

aggregate – close cluster or mix

air excavator – device that blows air at high force; used to remove soil from the root of trees

allelochemicals – naturally produced substances in plants that serve as part of the plant's defense against pests and that may have effects on the growth and development of other plants

allelopathy – chemical effect or inhibition of the growth or development of plants introduced by another plant

alternate – having leaves situated one at each node and alternating positions on the stem; this arrangement means the leaves are not across from each other

amon-eye nut – specialized nut used in cabling trees; has a large eye for attachment of the cable

anaerobic – Characterized by the absence of molecular oxygen (O_2)

anatomy – study of the structure and composition (of plants)

angiosperm – plants with seeds borne in an ovary; consisting of two big groups, moncotyledons and dycotyledons

anion – an ion that carries a negative charge

annual rings – see *growth* rings

ANSI A300 standards – industry-developed standards for the practice for tree care; acronym for American National Standards Institute

ANSI Z133.1 – safety standards for tree care operations

anthocyanins – red, purple, or blue pigments; responsible for those colours in some parts of trees and other plants

antigibberellin – plant growth regulator that inhibits the action to the plant hormone gibberellin

antitranspirant – substance sprayed on plants to reduce water loss through the foliage

apical – having to do with the tip

apical bud – terminal bud on a stem

apical dominance – condition in which the terminal bud inhibits the growth and development of lateral buds on the same stem

apical meristems – the growing points at the tips of shoots

appropriate response process (ARP) – method of systematically assessing plant health and client needs to determine which course of action, if any, is recommended

approved – acceptable to federal, state, provincial, or local enforcement authorities

arboriculture – the study of trees and other plants

arborist block – heavy-duty pulley with two attachment points and extended cheek plates; used in rigging operations

artificial respiration – forcing air into the lungs of a person who has stopped breathing

auxin – plant hormone or substance that promotes or regulates the growth and development of plants; it is produced at sites where cells are dividing, primarily in the shoot tips

available water – the water remaining in the soil after gravitational water has drained and before the wilting point has been reached

axial transport – movement of water, minerals, or photosynthate longitudinally within a tree

axillary bud – bud in the axil of a leaf; lateral bud

back cut – cut made on opposite side of a log toward the notch cut or face cut

backfill – soil (and amendments) put back into the hole when planting a tree

balance – in rigging, a technique used to lower a limb without allowing either end to drop

balled and burlapped (B & B) – having the root system and soil wrapped in burlap for moving and planting a tree or other plant

barber chair – dangerous condition created when a tree or branch splits vertically up from the back cut

bare root – tree or other plant taken from the nursery with exposed root system, without soil

bark – protective covering over branches and stem that arises from the cork cambium

bark tracing – cutting away torn or injured bark to leave a smooth edge

barrier – fences or other means used to establish a protection zone around trees on construction sites

belay – securing a climber's rope using wraps around a cleat, carabiner, or other device

bend – type of knot used to join two rope ends together

bend ratio – ratio of the diameter of a branch, sheave, or other device to the rope that is wrapped on it

bight – a curve or arc in the active part of a rope between the working end and the standing part

biodegradable – capable of decaying and being absorbed by the environment

biological control – method of controlling plant pests through the use of natural predators, parasites, or pathogens

biotic – pertaining to a living organism

biotic disorders – disorders caused by a living agent

bipinnate – double pinnate; see *pinnate*

blade – the expanded body of a leaf

Blake's hitch – a climber's friction knot sometimes used in place of the tautline hitch or Prusik knot

blight – any disease, regardless of the casual agent, that kills young, plant-growing tissues

block – a pulley used in rigging

body thrust – method of ascending a tree using a rope

bollard – a post on which wraps can be taken with a rope

boom – long, moveable arm of a bucket truck

botanicals – pesticides that are made from plants

bowline – looped knot used to attach items to a rope

bowline on a bight – knot that can be used as a makeshift saddle in an emergency situation

box cable system - tree cabling system that forms closed polygons; used to join together more than three branches

bracing – installation of metal rods through weak portions of a tree for added support

bracing rod – metal rod used to support weak sections or crotches of a tree

branch bark ridge – top area of a tree's crotch where the growth and development of the two adjoining limbs push the bark into a ridge

branch collar – area where a branch joins another branch or trunk created by the overlapping xylem tissues

branch protection zone – tissues inside the trunk or parent branch at the base of a subordinate branch that protect against the spread of decay

branch union – point where a branch originates from the trunk or another branch; crotch

broadcast fertilization – application of fertilizer over the soil surface

bud – small lateral or terminal protuberance on the stem of a plant that may develop into a flower or shoot; undeveloped flower or shoot

buffering capacity – ability of a soil to maintain its pH

bulk density – mass of soil per unit volume; often used as a measure of compaction

butt-hitching – method of lowering pieces when the rigging point is below the work

butt-tying – tying off a limb at the butt end of for rigging

buttress roots – roots at the base of the trunk; trunk flare

CPR – cardiopulmonary resuscitation

CSA – Canadian Standards Association

cable aid – device used to tighten lags and to aid in cable installation

cable clamp – a double-bolted, U-shaped clamp used to secure tree cables

cable grip – device used to attach extra-high-strength cable to lag hooks or eye bolts

cabling – installation of hardware in a tree to help support weak branches or crotches

cambium – layer(s) of meristematic cells that give rise to the phloem and xylem and allow for diameter increase in a tree

canker – localized diseased area, often shrunken and discoloured, on stems or branches

carabiner – oblong metal ring used in climbing and rigging that is opened and closed by means of a spring-loaded gate

carbohydrate – compound, combining carbon and water, produced by plants during photosynthesis

cardiopulmonary resuscitation – procedure used to force air into the lungs and to force blood circulation in a person who has suffered cardiac arrest

carotenoid – a yellow, orange, or red pigment responsible for those colours in some parts of trees and other plants

cation – a positively charged ion

cation exchange capacity (CEC) – ability of a soil to adsorb and hold cations

cavity – an open wound or hollow within a tree, usually associated with decay

cell – smallest unit of an organism that is capable of self-reproduction

cellulose – complex carbohydrate found in cellular walls of the majority of plants, algae, and certain fungi

central leader – the main stem of a tree, particularly an excurrent specimen

chaps – a form of leg protection; worn when operating chain saws

chlorophyll – green pigment of plants, found in chloroplasts; it captures the energy of the sun and is essential in photosynthesis

chloroplast – specialized organelle found in some cells; the site of photosynthesis

chlorosis – whitish or yellowish discolouration caused by lack of chlorophyll; often used in referring to a plant's foliage

chronic – disorder or disease occurring over a long period of time

class – taxonomic group below the division level but above the order level

climbing hitch – knot used as the primary friction knot (tie-in knot) in climbing

climbing line – a rope that meets specifications for use in tree climbing

climbing saddle – a harness designed for climbing trees

climbing spurs – sharp devices that can be strapped to a climber's lower legs to assist in climbing poles or trees being removed

clone – asexually produced organisms that are genetically identical

clove hitch – knot used to secure an object to a rope

CODIT – Compartmentalization Of Decay In Trees

codominant branches/codominant stems – forked branches of nearly the same size in diameter and lacking a normal branch union

come-along – portable cable winch used to draw two things closer together

command and response system – a system of vocal communication convention used in tree care operations

compaction – compression of soil resulting in the loss of macropores

companion cell – parenchyma cells associated with sieve tube members

compartmentalization – natural process of defense in trees by which they wall off decay in the wood; see *CODIT*

complete fertilizer – fertilizer that contains nitrogen, phosphorus, and potassium

complex – a combination of factors that contribute to the stress or decline of a tree

compound leaf – a leaf with two or more leaflets

conduction – carrying water or nutrients

conifer – a cone-bearing tree or other plant that has its seeds in a structure called a cone

conk – the fruiting body of a fungus, often associated with decay

contact insecticides – materials that cause injury or death to an insect after coming in contact with the pest

container grown – tree or other plant that has been grown in a container

containerized – plant available from the nursery with its root mass in a container

controlled-release fertilizer – slow-release or slowly soluble form of fertilizer

conventional notch – 45-degree notch with a horizontal bottom cut; used in felling trees

cordate – heart-shaped

cork cambium – meristematic tissue from which cork and bark develop to the outside

cracks – defects in trees that, if severe, may pose a risk of tree or branch failure

crenate – leaf margin with rounded teeth

cross section – section cut perpendicular to the axis of longitudinal growth

crown – the above ground portion of a tree

crown cleaning – removal of watersprouts and dead, dying, diseased, crossing, and hazardous branches from a tree

crown reduction - method of reducing the height or spread of a tree by performing appropriate pruning cuts

crown restoration – method of restoring the natural growth habit of a tree that has been topped or damaged in any other way

crown rot – disease or decay at the base of a tree or root flare

cultivar – a cultivated variety of a plant

cultural control – method of controlling plant pests by providing a growing environment favourable to the host plant and/or unfavourable to the pest

cuticle – waxy layer outside the epidermis of a leaf

cytokinin – plant hormone involved in cell division

D-rings – D-shaped metal rings on a climber's saddle used to attach ropes and snaps

dead-end grips – cable termination devices that must be used with extra-high-strength cable

dead-end hardware – cabling, bracing, or guying hardware that is terminated by screwing into the tree

deadwooding – removal of dead and dying limbs from a tree

decay – decomposition of woody tissues by fungi or bacteria

deciduous – tree or other plant that loses its leaves sometime during the year and leafless generally during the cold season

decurrent – rounded or spreading growth habit of the crown of a tree

deficiency – lack or insufficient quantity of a required element

defoliation – loss of leaves from a tree or other plant by biological or mechanical means

dehiscent – opening spontaneously at maturity to release seeds

dentate – having marginal teeth that are perpendicular to the leaf margin

desiccation – total drying out

design criteria – aspects of the site and required functions to be served by the plant that must be considered in plant selection

design factor – factor by which the tensile strength of a rope or piece of hardware is reduced to arrive at the working-load limit for a given application

dicot – see *dicotyledon*

dicotyledon – plant with two cotyledons in its embryo

dieback – condition in which the ends of the branches are dying

differentiation – process in the development of cells in which they become specialized for various functions

diffuse porous – pattern of wood development in which the vessels are distributed evenly throughout the annual ring

dioecious – plant with unisexual flowers with each sex confined to separate plants

direct cable system – simple tree cabling system to join two branches

direct contact – when any part of the body touches an electrical conductor

division – taxonomic division below kingdom level but above class level

dormant – state of reduced physiological activity in the organs of a plant

double braid – rope construction that consists of a braided rope within a braided rope

double crotch – climbing technique consisting of tying into two places in a tree

double serrate – toothed margin of a leaf with smaller teeth within

downy mildew – white fungal growth emerging from water-soaked tissue, usually on the underside of the leaf

drill-hole method – applying fertilizer by drilling holes in the soil occupied by the roots or surrounding them

drip irrigation – method of watering in which water evaporation and runoff are minimized

drip line – perimeter of the area under a tree delineated by the crown

drop-crotch pruning – method of reducing the height of a tree; see *reduction*

drop cut – branch-removal technique consisting of an undercut and a top cut farther out on the branch

drop zone – area where cut branches or wood sections will be dropped from a tree

drum lace – method of tying a balled-and-burlapped tree root ball for moving

dynamic loading – forces created by a moving load; load that changes with time

electrical conductor – body or medium that allows the passage of electricity; while working on trees, generally this will be any overhead or underground electrical device, including communication cables and power lines that have electricity or the potential to have it

emergency response – predetermined set of processes by which emergency situations are assessed and handled

entire – leaf margin without teeth

epicormic – arising from latent or adventitious buds

epidermis – outer tissue of leave, stems, roots, flowers, and seeds

epinasty – distortion of growth

espalier – specialized technique of pruning and training plants to grow within a plane

essential elements – the 17 minerals essential to the growth and development of trees

ethylene gas – naturally occurring plant growth substance that triggers fruit ripening

evapotranspiration (ET) – moisture lost by evaporation of the soil's water and transpiration of the plant

evergreen – tree or plant that keeps its needles or leaves year round; this means for more than one growing season

excurrent – tree growth habit with pyramidal crown and central leader

exfoliating – peeling off in shreds or layers

extra-high-strength cable – type of cable used in supporting trees; stronger but less flexible than standard wrapped cable

exudation – oozing out

eye bolt – a drop-forged, closed-eye bolt installed in trees attach cable

eye splice – technique used to attach common-grade cable to eye bolts or lags

eyesplice – termination in a rope forming an eye and made by splicing the rope back upon itself

face cut – a notch cut used in felling trees or limbs

fall protection – equipment and techniques designed to ensure a climber will not fall from a tree

false crotch – device installed in a tree to set ropes during climbing or rigging when there is not a suitable natural crotch available

family – the taxonomic division under the order level and above the genus level

fermentation – incomplete path of respiration in the absence of sufficient oxygen

fertilizer – substance added to a plant or the surrounding soil to supplement the supply of essential elements

fertilizer analysis – the percentage of nitrogen, phosphorus, and potassium in a fertilizer

fertilizer burn – injury to plants resulting from excess fertilizer salts in the surrounding soil

fiber – elongated, tapering, thick-walled cell that provides strength

field capacity – the point at which soil becomes saturated and cannot absorb any more water.

figure-8 descender – metal device used in rigging

figure-8 knot – safety knot or stopper tied in the climbing knot

first aid – emergency care or treatment of the injuries or illnesses of a person to stabilize his or her condition before medical help is available

foliage – the leaves of a plant

foliar analysis – laboratory analysis of the mineral content of foliage

foliar application – application of fertilizer or other substance by direct spray on the foliage

footlocking – method of climbing a rope by wrapping the rope around one's feet

friction device – device used to take wraps in a load line; provides friction for controlled lowering

friction hitch – any of several friction knots used in climbing trees or rigging

fronds – large, divided leaves, as in palms

fruiting bodies – the reproductive structures of fungi, the presence of which may indicate decay in a tree

fungicides – chemical compounds that are toxic to fungi

gall – swelling of plant tissues; frequently caused by insects, nematodes, fungi, or bacteria

genus – a group of species having similar fundamental traits; botanical classification under the family level and above the species level

geotropism – plant growth produced as a response to the force of gravity; it can be positive as in the roots, or negative as in the trunk

gibberellin – a plant growth substance involved in cell elongation

girdling – inhibition of the flow of water and nutrients in a tree by choking vascular elements

girdling root – root that grows around a portion of the trunk of a tree, causing inhibition of the flow of water and nutrients by choking the vascular elements

glaucescent – having a somewhat glaucous appearance or nature; becoming glaucous
glaucous – covered with a grayish, bluish, or whitish waxy coating or bloom that is easily rubbed off: glaucous leaves

gravitational water – water that drains from the soil's larger macropores under the force of gravity

ground rod – 10-foot (3-meter) metal rod used in grounding a lightning protection system

grounded – electrically connected to the earth

growth rate – speed at which something grows

growth rings – rings of annual xylem visible in a cross section of the trunk of some trees

guard cells – pair of cells that regulate the opening and closing of a stomate due to a change in water content

gummosis – exudation of sap or gum, often in response to disease or insect damage

guying – securing a tree, if needed, with ropes or cables fastened to anchors in the ground or another tree

gymnosperm – plant with seeds exposed

half hitch – simple wrap of a rope used to secure a line temporarily

hardened off – acclimated to the cold or to a new environment

hardiness – ability of a plant to survive low temperatures

hazard assessment – process by which the risk potential or a tree is determined

heading back – topping; cutting limbs back to buds, stubs, or lateral branches not large enough to assume apical dominance

heartwood – inner, nonfunctional xylem tissues that provide structural resistance to the trunk

hinge – a strip of wood fibers created between the notch and the back cut that help control direction in tree felling

hinge cut – sequence of cuts used to control the direction of a limb being removed

hitch – a knot made when a rope is secured around an object or its own standing part

hollowed braid – rope construction characterized by a braided rope with no core

honeydew – substance secreted by certain insects when feeding upon plants

horizon – layer of soil within the soil profile

horticultural oils – highly refined petroleum oils used to smother insects and disrupt their membranes

Humboldt notch – a felling notch that is horizontal on the top and angled on the bottom

IPM – see *Integrated Pest Management*

identification key – aid used to help identify plants

imbricate – where one tepal is outside all others, one is inside all others, and the others are outside on one margin and inside on the other

implant – device, capsule, or pellet that can be inserted into a tree to treat disorders

included bark – bark that becomes embedded in a crotch between branch and trunk or between codominant stems and causes a weak structure

increment borer – device used to take core samples from trees for the purpose of determining age or detecting problems

indirect contact – touching any conductive object that is in contact with an electrical conductor

infectious – capable of being spread from plant to plant

infiltration – downward entry of water into the soil

infiltration rate – speed at which water soaks into the soil

inorganic fertilizer – mineral fertilizer, not coming from plant or animal

insect growth regulators – substances, naturally occurring in insects, that affect growth and development

insecticidal soaps – mild salts of fatty acid that disrupt insect life process

insecticides – substances that are toxic to insects

Integrated Pest Management (IPM) – method of controlling plant pests combining biological, cultural, and chemical controls

internodal – between two nodes on a stem

internode – the region of the stem between two successive nodes

interveinal tissue – leaf tissue between the veins or vascular bundles

introduced species – plant species that are not native to a region

involucre – a series of bracts beneath or around a flower or flower cluster. The cupule, the cuplike structure holding an oak acorn, is a modified, woody involucre

ion – one atom or group of atoms with a positive or negative charge

job briefing – brief meeting of a tree crew at the start of every job to communicate the work plan, responsibilities and requirements, and any potential hazards

jump cut – branch-removal technique consisting of an undercut and a top cut closer in on the branch

kerf – slit or cut in a log made by a saw

kernmantle – rope manufactured to have a core and woven sheath

key – plant identification tool used to determine a plant species

kickback – sudden backward or upward thrust of a chain saw

kickback quadrant – upper quadrant of the tip of a chain saw bar

kingdom – the primary division in taxonomy, separating plants from animals

lag eye – lag-threaded cable anchor with a closed eye

lag hook/J-hook – J-shaped bolt used to attach cables to trees

lag-threaded rod – steel bracing rod used to screw into pre-drilled hole to provide added support to a tree

landing zone – predetermined area where parts will be brought down in a rigging operation

landscape function – the environmental, aesthetic, or architectural functions that a plant can have

lanyard – a short rope equipped with snaps or carabiners; work-positioning lanyards are used for temporarily securing a climber in one place

larva – immature life stage of an insect

lateral – secondary or subordinate branch

lateral bud – vegetative bud on the side of a stem

lateral root – side-branching root that grows horizontally

leach/leaching – tendency for elements to wash down through the soil

leader – the primary terminal shoot or trunk of a tree

leaf apex – tip of the leaf blade

leaf base – bottom part of the leaf blade

leaf blotch – irregularly shaped areas of disease on plant foliage

leaf margin – outer edge of the leaf blade

leaf scar – scar left on the twig after a leaf falls

leaf spot – patches of disease or other damage on plant foliage

leaflet – separate part of a compound leaf blade

leg protection – chaps or other protective clothing worn over the legs when operating a chain saw

lenticel – opening in the bark that permits the exchange of gases

liability – something for which one is responsible; legal responsibility

lignin – substance that impregnates certain cell walls

lion tailing – poor pruning practice in which limbs are thinned from the inside of the crown to a clump of terminal foliage

liquid injection – method of injecting liquid forms of fertilizer into the surrounding soil of a tree

load line – rope used to lower a tree branch or segment that has been cut

lobe – projecting segment of a leaf blade

lowering device – instrument attached to the base of a tree in rigging; used to take wraps with the load lines

machine-threaded rod – steel rod used in cabling and bracing; must be terminated with washers and nuts

macronutrient – any of the essential elements required by plants in relatively large quantities

macropore – larger spaces between soil particles that are usually air-filled

main conductor – primary conductor cable of a lightning protection system; standard down conductor

mature height – the maximum height that a plant can reach if the conditions of the planting site are favourable

meristem – undifferentiated tissue in which active cell division takes place

microinjection – method used to introduce chemicals directly into the xylem of trees

micronutrient – any of the essential elements required by plants in relatively small quantities

micropore – space between soil particles that is relatively small and likely to be water filled

micropulley – small pulley used by tree climbers

minimum irrigation – the practice of minimal irrigation through the use of drought-tolerant plants and watering only when necessary due to reduced rainfall

mismatch cut – cut type used in branch removal in which offset, overlapping cuts allow the section to be manually broken off; snap cut

mitigation – process of reducing damages or risk

monitoring – keeping a close watch; performing regular checks or inspections

monocot – see *monocotyledon*

monocotyledon – a plant whose embryo has one seed leaf (cotyledon)

monoecious – a plant with both sexes on the same plant

morphology – study of the form and structure of living organisms; in this case, of plants

mortality spiral – sequence of events causing the decline, and eventually death, of a tree

mycorrhizae – a symbiotic naturally attaches itself to fine feeder roots and grows its own roots, hyphae which mine the soil for minerals and water to bring into the feeder roots

native species – indigenous to a region

naturalize species – a non-native species that has become established in a region

necrosis – localized death of a tissue in a living organism

needle – slender conifer leaf

negligence – failure to exercise due care

nematode – microscopic roundworm; some feed on plant tissues and may cause disease

node – slightly enlarged portion of a stem where leaves and buds arise

nomenclature – scientific naming system for living, organisms; scientific names are written in Latin, the genus first (starting with capital letter), followed by the species (always with lowercase letter)

notch – a wedge cut into a log or tree for felling

nutrient cycling – movement of mineral nutrients within an ecosystem as organic matter decomposes and is recycled in plants

oblique – lop-sided, one side larger than the other

obtuse – rounded, approaching semi-circular

Occupational Safety and Health Act (OSHA) – in the United States, the legislative act dealing with health and safety in the work place; administered by the Occupational Safety Administration; Occupational Health and Safety Administration (OHSA) in Canada

oedema (edema) – watery swelling in plant tissue

oils – highly refined petroleum oils used to smother insects and disrupt their membranes

open-face notch – wedge-shaped cut (commonly about 70 degrees) used in felling or removing tree sections

opposite – opposite leaf arrangement; leaves situated two at each node, across from each other on the stem

order – taxonomic division below class level but above family level

organic fertilizer – fertilizer derived from plants or animals

organic layer – layer of organic matter at the soil's surface

osmosis – diffusion of water through a semi-permeable membrane from a region of higher water potential to a region of lower water potential

outriggers – projecting structures on boom trucks

pH – a measure of acidity or alkalinity of a medium

palmate – radiating in a fanlike manner; type of compound leaf

parasite – organism living in or on another organism from which it derives nourishment

parenchyma cells – thin-walled, living cells essential in photosynthesis

parent material – soil bedrock material from which the soil's profile develops

pathogen – casual agent of disease

perched water table – accumulation of water in an upper soil layer

percolation – movement of water through the soil

permanent branches – branches that will be left in place, often forming the initial scaffold framework of a tree

permanent wilting point – point at which a plant cannot pull any more water from the soil

personal protective equipment (PPE) – personal safety gear such as hard hats, safety glasses, and hearing protection

pest resistance – in plants, the tendency to withstand, or not to get, certain pest problems

pesticides – chemicals used to kill unwanted organisms such as weeds, insects, or fungi

pest resurgence – increase in the population of a pest following a reduction in the population of natural predators or parasites of that pest

petiole – the stalk of a leaflet

phenols – naturally produced organic alcohols with acidic properties; one of several chemical defense compounds in trees

pheromone – chemical substance produced by insects that serves as a stimulus to other insects of the same species

phloem – plant vascular tissue that conducts photosynthates; situated to the inside of the bark

photoperiod – length of daylight required for certain developmental processes and growth of a plant

photosynthate – general term for the products of photosynthesis

photosynthesis – the process in green plants (and in some bacteria) by which light energy is used to form organic compounds from water and carbon dioxide

phototropism – influence of light on the direction of plant growth

phylum – primary taxonomic division within a kingdom; the plural is phyla

physiological disorder – in plants, a disorder not caused by an insect, pathogen, or injury

physiology – the study of the life function (of a plant)

phytotoxic – a term used to describe a compound that is poisonous to plants

pigment – substance that appears coloured due to the absorption of certain light wavelengths

pinnate – compound leaf with leaflets along each side of a common axis

pioneer tree – is of the pioneer species which colonize previously uncolonized land, usually leading to ecological succession. They are the first organisms to start the chain of events leading to a livable biosphere or ecosystem.

Since uncolonized land may have thin, poor quality soils with few nutrients, pioneer species are often hearty plants with adaptations such as long roots, root nodes containing nitrogen-fixing bacteria, and leaves that employ transpiration. They will die and break down after some time, making new soil for secondary succession, and nutrients.

plant growth regulator – a compound, effective in small quantities, that affects the growth and development of plants

plant growth substance – a naturally produced compound, effective in small quantities, that affects the growth and development of plants; see *plant hormone*

Plant Health Care (PHC) – a holistic and comprehensive program to manage the health, structure, and appearance of plants in the landscape

plant hormone – substance produced by a plant that affects physiological processes such as growth; see *plant growth substance*

planting specifications – detailed plans and statements of particular procedures and standards for planting

pole pruner – long-handled tool used to make small pruning cuts that cannot be reached with hand tools

pole saw – long-handled tool with a pruning saw on the end

pollarding – a specialty pruning technique used on large-maturing trees that results in the development of callus at the cut ends of the branches

positive-locking – unable to be opened unintentionally; locks automatically and requires two or more motions before opening

powdery mildew – white or grayish fungal growth on the surface of stems or foliage

preformed tree grip – device used to attach extra-high-strength cable to lag hooks or eye bolts

prescription fertilization – philosophy of basing fertilization recommendations on plant needs

pruning – cutting away unwanted parts of a plant

Prusik hitch – type of multi-wrapped friction hitch used in climbing and rigging; used to attach the Prusik loop to the climbing line when footlocking

Prusik loop – loop of rope, smaller in diameter than the climbing line, used for the secured footlock method of ascending a rope

radial aeration – means of aerating the soil in the root zone of a tree by removing and replacing soil in a spokelike pattern

radial transport – movement of substances in a tree perpendicular to the longitude axis of the tree

radial trenching – method of improving aeration in the root zone of a tree; radial aeration

raising – removing lower limbs from a tree to provide clearance

ray – tissues that extend radially across the xylem and phloem of a tree

reaction wood – wood formed in leaning or crooked stems, or on lower or upper sides of branches

reaction zone – a natural boundary formed by a tree to separate wood infected by disease organisms from healthy wood; important in the process of compartmentalization

reactive forces – the forces generated in operating a chain saw

redirect rigging – changing the path of a rigging line to modify the forces or the direction of limb removal

reduction – pruning to decrease the height and/or spread of a branch or crown

rescue kit – climbing gear and emergency equipment that should be set out on every job site so that it is available in an emergency situation

rescue pulley – light-duty pulley used in rigging operations

resistance – in plants, the tendency to withstand, or not to get, certain diseases

resistance varieties – plants that are tolerant of, or not susceptible to, certain disease or pest problems

resource allocation – distribution and use of photosynthate for various plant functions and processes

respiration – process by which carbohydrates are converted into energy by using oxygen

restoration – pruning to improve the structure, form, and appearance of trees that have been severely headed, vandalized, or damaged

rhizosphere – immediate environment of roots where biological activity is high

rigging – method of using ropes and hardware to remove large limbs or take down trees

rigging line – rope used in rigging operations; usually the load-bearing line

rigging point – the place in a tree (natural or false crotch) that the load line passes through to control limb removal in rigging operations

ring porous – pattern of wood development in which the large-diameter vessels are concentrated in the earlywood

risk assessment – process of determining the level of risk posed by a tree or group of trees on a property

risk management – process of assessing and controlling risk in tree management

root ball – containment of roots and soil of a tree or other plant

root crown – the upper-most portion of the root system where the major roots join together at the base of the stem or the trunk

root hair – modified epidermal cells of a root that aid in the absorption of water and minerals

root pruning – in transplanting, the process of pre-digging a root ball to increase the density of root development within the final ball

rope sling – a section of rope, usually with at least one eyesplice, used to secure equipment or tree sections in rigging operations

running bowline – knot often used to tie off limbs for removal

rust – disease caused by a certain group of fungi and characterized by reddish brown spots

sanitation – practice of removing dead or diseased plant parts to reduce the spread of disease

sapwood – outer wood that actively transports water and minerals

scabbard – sheath for a pruning saw

scaffold branches – the permanent or structural branches of a tree

scale – one of a group of insects that attach themselves to plant parts and suck the sap

scorch – browning and shrivelling of foliage, especially at the leaf margin

screw link – connecting device with a threaded closure mechanism; used in rigging operations

secondary nutrients – nutrients required in moderate amounts by plants

secondary pest outbreak – increase in secondary pest population following a reduction in the population of natural predators or parasites

secured footlock – method of ascending a rope in which the climber is secured against a fall

serrate – sawtooth margin of a leaf with the teeth pointed forward

shackle – a U-shaped fitting with a pin run through it; clevis

shakes – separation of the growth rings in wood

shall – the word that designates a mandatory requirement in the ANSI standards

sheave – the inner fitting within a block over which the rope runs

ship auger – type of drill bit used to drill holes in trees for cable installation

shock-loading – the dynamic load placed on a rope or rigging apparatus when a moving log is stopped

should – the word that designates an advisory recommendation in the ANSO standards

sieve cells – long, slender phloem cells in gymnosperms

sieve tube elements – specialized phloem cells involved in photosynthate transport

sign – the physical evidence of a casual agent

simple leaf – a single, one-part leaf; not composed of leaflets

sink – a plant part that uses more energy than it produces

sinker roots – downward-growing roots that take up water and minerals; most are in the top 12 inches (30 centimeters) of soil

sinus – space between two lobes of a leaf

site analysis – determination of the conditions, environment, and needs of a planting site

site considerations – the factors that must be taken into account when assessing a planting site to select plant species

skeletonized – leaves that have had the tissue removed from between veins by insects

sling – device used in rigging to secure equipment or pieces being rigged

slowly soluble fertilizer – a fertilizer that has some particles coated to delay the dissolving of the minerals

snap – connecting device used by tree climbers primarily for connecting the climbing line to the saddle

snap cut – cut type used in branch removal in which offset, overlapping cuts allow the section to be manually broken off; mismatch cut

soil amendment – material added to soil to improve its physical or chemical properties

soil analysis – analysis of soil to determine pH, mineral composition, structure, and other characteristics

soil auger – device for removing cores of soil for inspecting or testing

soil compaction – compression of the soil resulting in reduction of the total pore space, especially the macropores

soil profile – vertical section through a soil, through all of the horizons

soil structure – the arrangement of soil particles

soil texture – the relative fineness or coarseness of a soil due to a particle size

source – plant part that produces carbohydrates; mature leaves are sources

species – a group of organisms composed of individuals of the same genus name that can reproduce among themselves and have similar offspring

specific epithet – the classification name that follows the genus name in scientific nomenclature

specifications – detailed plans and statements of particular procedures and standards

speed lining – a method of lowering tree segments past obstacles below

speedline – rigging line strung in such a way as to slide tree segments to the ground

splits – open cracks or fissures in tree trunks or branches

split-tail – tree climbing system in which the climbing hitch is formed with a separate, short length of rope

square knot – a knot used to tie together two ropes of equal diameter

staking – supporting a newly planted tree with stakes

stand delineation – general overview of the trees describing species composition, diameter distribution, age class and condition at a stand or individual tree level

standard down conductor – length of copper cable used in lightning protection systems on trees

standing part – the inactive part of a rope, as opposed to the working end

stippling – speckled or dotted areas on foliage

stomata – small pores between two guard cells on leaves and other green plant parts thorough which gases are exchanged

stopper knot – knot tied in the end of line to keep the tail from passing through the climbing hitch

stress – factor that negatively affects the health of a tree

structural defects – flaws, decay, or other faults in the trunk, branches, or root collar or a tree, which may lead to failure

structural pruning – pruning to establish a strong branch scaffold system

stunting – growth reduction of organisms, in this case, plants

subordinate – pruning to reduce the size and growth of a branch in relation to other branches or leaders

subsurface application – placement of fertilizer below the soil surface

sucker – shoot arising from the roots

surface application – placement of fertilizer or other material on the soil surface

symbiosis – a mutually beneficial association of two different types of living organisms

symbiotic – a mutually beneficial association

symbiotic relationship – association between two organisms that is mutually beneficial

symptom – a plant's reaction to a disorder

systemic – substance that moves throughout and is absorbed by the entire organism, in this case, by the roots, leaves, or both

tagline – rope used to control the swing and direction of drop of a limb being removed

tannins – organic substances produced by trees; believed to be involved in the tree's chemical defense processes

tap root – central, vertical root that grows right below the trunk and is often choked off by the development of other roots

taper – the change in diameter over the length of trunks and branches

target – person, object, or structure that could be injured or damaged in the event of tree or branch failure

tautline hitch – type of climbing hitch used by climbers to tie in

taxonomy – science that studies the description, denomination, and classification of living organisms, based on their similarities and differences

temporary branches – branches left in place when training young trees; such branches will be removed later

tensile strength – the breaking strength of a rope under load

tensiometer – instrument used to measure soil moisture

terminal bud – the bud on the end of a twig or shoot

terracing – method used to lower the soil grade in stages

thimble – device used in cabling to form the loop in the cable

thinning – selective removal of unwanted branches and limbs to provide light or air penetration through the tree or to lighten the weight of the remaining branches

threaded rod – metal rod used for support bracing of trees

thresholds – pest population levels requiring action

through-hardware – anchors or braces that pass completely through a trunk or branch and are secured with washers and nuts

throwing ball – device used to set a rope in a tree

throwing knot – a series of loops and wraps tied in a rope to form a weight for throwing

throwline – device consisting of a small weight attached to a thin, lightweight cord; used to set climbing ropes in trees

tie in – to secure a climber's rope in a tree with a tautline hitch

timber hitch – knot consisting of a series of wraps on a rope; used to secure the rope to a limb or tree

tip tying – tying a rope on the tip (brush) end of a limb or tree

topping – cutting back a tree to buds, stubs, or lateral not large enough to assume apical dominance

torts – wrongful acts, other breach of contract, for which civil action may be taken

tracheid – elongated, tapering xylem cell, adapted for support

translocated – movement of sugars in the phloem

transpiration – water vapour loss through the stomata of leaves

transplant shock – stress following transplant in which growth is reduced and the tree may wilt or drop foliage

transplanting – moving a plant to a new location

tree island – soil or landscape surrounding a tree, such as within a paved area

tree spade – mechanical device used to dig and move trees

tree well – wall constructed around a tree when the soil grade is raised to maintain the original soil level and provide oxygen to the root zone

tree wrap – material used to wrap the trunks of newly planted trees

trenching – digging to install utilities; of concern due to root damage

triangular cable system – tree cabling that forms a triangular shape

tropism – growth movement or variation of a plant as a response to an external stimulus such as light or gravity

tunneling – alternate means to trenching for installation of underground utilities

turgid – fully hydrated to a normal state of distension

undercut – a cut on the underside of a limb to be removed to prevent unwanted tearing as the limb falls

utility pruning – pruning around or near utility facilities with the object of maintaining safe and reliable utility service

variety – subdivision of a species having a distinct difference, and breeding true to that difference

vascular discolouration – darkening of the vascular tissues of woody plants in response to disease

vascular tissue – tissue that conducts water or nutrients

vector – organism that transmits a pathogen

venation – arrangement of veins

vertical mulching – filling vertical drilled holes in the soil with materials such as gravel, perlite, peat, or sand

vessels – stacked, tubelike, water-conducting cells in the xylem

vigor – overall health; capacity to grow and resist stress

vista pruning – selective pruning to allow a view from a predetermined point

vitality – overall health; a plant's ability to deal effectively with stress

water shoot – a secondary, upright shoot arising from the trunk, branches or roots of a plant

water-holding capacity – ability of a soil to hold moisture

water-insoluble nitrogen (WIN) – nitrogen fertilizer in a form that is not soluble in water

watersprout – an upright, adventitious shoot arising from the trunk or branches of a plant; although incorrect, it is also called a sucker

webbing sling – length of sewn webbing, often formed into a loop, used as an attachment in rigging

whorled – leaves arranged in a circle around a point on the stem

wilt – loss of turgidity and subsequent drooping of leaves

wire basket – type of metal basket used to support the root ball of balled-and-burlapped plants

witch's broom – plant disorder in which large number of accessory shoots develop

work plan – predetermined, orderly means for job completion

working end – the part of a rope terminated for use

working-load limit (WLL) – tensile strength divided by design factor; load limit for a rope or piece of equipment

work-positioning lanyard – rope or strap designed to aid in climbing and tree work; secondary means of attachment

wound dressing – compound applied to tree wounds or cuts, if necessary

xylem – main water- and mineral-conducting tissue in trees and other plants; provides structural support and becomes wood after lignifying