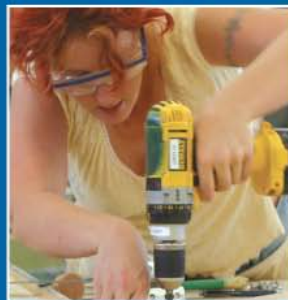
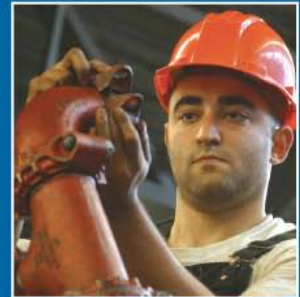


# Landscape Horticulturist Program Outline



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# **LANDSCAPE HORTICULTURIST PROGRAM OUTLINE**

**June, 2007**

**Developed By  
Industry Training Authority  
Province of British Columbia**

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## FOREWORD

The Program Outline presented in this document outlines the Landscape Horticulture Apprenticeship Program. This program represents the new standard for horticulture apprenticeship training in British Columbia. This document and the outlines attached will be used as a guide for instructors in the classroom, laboratories and for practical training.

Since this is a practical trade it is expected that demonstration and student participation will be integrated into all learning activities.

Safe working practices are thematic in this program. Though they are not specified in all competencies and learning tasks, they are implied as part of the program and should be stressed throughout the apprenticeship training.

The program outline also provides facility and instructor requirements as well as textbook recommendations.

### **SAFETY ADVISORY**

Be advised that references to the WorkSafe BC 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 BC Landscape and Nursery Association and the by HortEducationBC.

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# **SECTION 1**

## **OCCUPATION ANALYSIS CHART**

## Landscape Horticulturist Program Outline Occupation Analysis Chart

<p><b>Demonstrate the ability to identify plants and describe their use.</b></p> <p style="text-align: right;">A</p>	<p>Identify a wide range of plants, morphological characteristics, growing requirements, use and availability.</p> <p style="text-align: right;">A1</p>	<p>Practice plant identification skills to identify plants used in all segments of horticulture. Identify plants suitable for planting in difficult situations.</p> <p style="text-align: right;">A2</p>	<p>Practice plant identification skills. Identify species suitable for landscape and production situations as well as tropical, floral, and indoor landscapes.</p> <p style="text-align: right;">A3</p>	<p>Practice plant identification skills. Identify native species suitable for landscapes and common seasonal crops used in landscapes</p> <p style="text-align: right;">A4</p>																			
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<p><b>Practice equipment maintenance and safety.</b></p> <p style="text-align: right;">C</p>	<p>Practice maintenance on small one-cylinder engines and horticulture hand tools. Demonstrate personal safety in the workplace and identify fire types and extinguishing methods.</p> <p style="text-align: right;">C1</p>	<p>Practice maintenance on multiple cylinder engines. Describe safe operating procedures for horticulture equipment.</p> <p style="text-align: right;">C2</p>																					
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<p><b>Describe plant science as it applies to horticulture.</b></p> <p style="text-align: right;">D</p>	<p>Explain plant morphological characteristics, life cycles, and adaptations as they apply to plant identification, plant propagation, arboriculture and turf maintenance. D1</p>	<p>Examine the internal anatomy of stems, roots and leaves as they related to photosynthesis, respiration, and transpiration.</p> <p style="text-align: right;">D2</p>																					
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<p><b>Describe plant health and pest management.</b></p> <p style="text-align: right;">E</p>	<p>Identify signs and symptoms of living and non-living factors that cause plant stress.</p> <p style="text-align: right;">E1</p>	<p>Examine biological characteristics of weeds, plant feeders and pathogens and list control strategies.</p> <p style="text-align: right;">E2</p>	<p>Explain the management of insect, weed, disease, mollusc and vertebrate pests in landscapes.</p> <p style="text-align: right;">E3</p>	<p>Describe the basic concepts of Integrated Pest Management in the Landscape</p> <p style="text-align: right;">E4</p>																			
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<b>Manage soils.</b> F	Describe physical and biological characteristics of soil, and soil-less media. F1	Describe chemical characteristics of soil and soil-less media. F2	Asses landscape sites with respect to soils. F3															
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<b>Practice horticultural skills</b> H	Demonstrate basic horticultural skills. H1	Assess plant quality and demonstrate plant-handling requirements. H2	Practice installation of hardscapes. H3															
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<b>Demonstrate maintenance and installation of residential irrigation and drainage systems.</b> I	Demonstrate maintenance of basic residential irrigation systems. Describe the installation of simple drainage systems. I1	Demonstrate irrigation and drainage design principles. I2																
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<b>Landscape Estimating</b> J	Prepare estimates for basic landscape installation projects. J1																	
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<b>Demonstrate maintenance of turfgrass.</b> L	Demonstrate maintenance of turfgrass. L1	Schedule turfgrass maintenance activities. L2																
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**SECTION 2**

**LANDSCAPE HORTICULTURIST**

**PROGRAM OUTLINE**

## SUGGESTED SCHEDULE OF TIME ALLOTMENT FOR LANDSCAPE HORTICULTURIST

### LINE A Demonstrate the ability to identify plants and describe their use.

		Lecture	Practical	Page
A1	Identify a wide range of plants, morphological characteristics, growing requirements, use and availability.	6	18	8
A2	Practice plant identification skills to identify plants used in all segments of horticulture. Identify plant suitable for planting in difficult situations.	6	18	19
A3	Practice plant identification skills. Identify species suitable for landscape and production situations as well as tropical, floral, and indoor landscapes.	6	18	29
A4	Practice plant identification skills. Identify species suitable for landscapes and common seasonal crops used in landscapes.	6	18	40

### LINE B Demonstrate effective supervision.

		Lecture	Practical	Page
B1	Demonstrate supervisory skills based on time and stress management, ethics, communication, power and teams.	9	9	9
B2	Demonstrate supervisory skills based on leadership, motivation and delegation. Describe safety management and managing in a diverse workplace.	9	9	20

### LINE C Practice equipment maintenance and safety.

		Lecture	Practical	Page
C1	Practice maintenance on small one-cylinder engines and horticulture hand tools. Demonstrate personal safety in the workplace and identify fire types and extinguishing methods.	6	12	10
C2	Practices maintenance on multiple cylinder engines. Describe safe operating procedures for horticulture equipment.	6	12	21

### LINE D Describe plant science as it applies to horticulture.

		Lecture	Practical	Page
D1	Explain plant morphological characteristics, life cycles, and adaptations as they apply to plant identification, plant propagation, arboriculture, and turf maintenance.	12	18	11
D2	Examine the internal anatomy of stems, roots, and leaves as they relate to photosynthesis, respiration and transpiration.	12	18	22

### LINE E Describe plant health and pest management.

		Lecture	Practical	Page
E1	Identify signs and symptoms of living and non-living factors that cause plant stress.	12	18	13
E2	Examine the internal anatomy of stems, roots, and leaves as they relate to photosynthesis, respiration and transpiration.	12	18	24
E3	Explain the management of insect, weed, disease, mollusk and vertebrate pests in landscapes.	12	15	30
E4	Describe the basic concepts of Integrated Pest Management in the landscape.	12	15	41

## **LINE F Manage soils.**

		<b>Lecture</b>	<b>Practical</b>	<b>Page</b>
F1	Describe physical and biological characteristics of soil, and soil-less media.	12	18	15
F2	Describe chemical characteristics of soil and soil-less media.	12	18	25
F3	Assess landscape sites with respect to soils.	12	12	31

## **LINE G Manage plants in the landscape.**

		<b>Lecture</b>	<b>Practical</b>	<b>Page</b>
G1	Demonstrate basic pruning of trees, shrubs, groundcovers and vines.	12	15	33
G2	Describe cultural management of trees, shrubs, groundcovers and vines.	12	12	42

## **LINE H Practice Horticulture Skills**

		<b>Lecture</b>	<b>Practical</b>	<b>Page</b>
H1	Demonstrate basic horticultural skills.	6	18	17
H2	Assess plant quality and demonstrate plant-handling requirements.	6	18	27
H3	Practice installation of hardscapes.	9	15	43

## **LINE I Demonstrate maintenance and installation of residential irrigation and drainage systems.**

		<b>Lecture</b>	<b>Practical</b>	<b>Page</b>
I1	Demonstrate maintenance of basic residential irrigation systems. Describe the installation of simple drainage systems.	12	15	35
I2	Demonstrate irrigation and drainage design principles.	12	15	45

## **LINE J Prepare estimates for basic landscape installation projects.**

		<b>Lecture</b>	<b>Practical</b>	<b>Page</b>
J1	Prepare estimates for basic landscape installation projects.	9	9	36

## **LINE K Describe the principles of garden design.**

		<b>Lecture</b>	<b>Practical</b>	<b>Page</b>
K1	Describe the principles of garden design.	9	9	46

## **LINE L Demonstrate maintenance of turfgrass.**

		<b>Lecture</b>	<b>Practical</b>	<b>Page</b>
L1	Demonstrate maintenance procedures for a variety of turfgrass situations.	12	15	38
L2	Schedule turfgrass maintenance activities.	12	15	47

# **PROGRAM OUTLINE FOR LEVEL 1**

**LINE A: IDENTIFY PLANTS AND DESCRIBE THEIR USE**

**Competency: A1 Identify a wide range of plants, morphological characteristics, growing requirements, use and availability.**

**Learning Objectives:**

- 1 Apprentices will practice skills that will enable them to identify a wide range of plants used in all segments of horticulture including examples of trees
- 2 Apprentices will study the important plant characteristics of leaves

**Learning Tasks**

- 1 Identify and describe 50 woody and non-woody plants
- 2 Employ correct naming and plant identification terminology
- 3 Name the plant family for each plant identified
- 4 Use a dichotomous key for plant identification purposes
- 5 Recognize a range of plant materials commonly used in commercial horticulture
- 6 Recognize and describe bud, bark, foliage, flower and fruit characteristics

**Content**

- identify and describe, using botanical terms, 50 woody and non-woody plants
- identify and describe each plant according to its cultural and maintenance requirements
- use binomial nomenclature and botanical terminology to correctly name plants according to the Royal Horticultural Society standard for nomenclature
- correctly name the plant family for each plant identified according to the Royal Horticultural Society standard for nomenclature
- use a dichotomous key for the identification of both deciduous and coniferous plants
- recognize the plant material common to nursery, landscape, and floriculture
- describe bud characteristics, such as, morphology, type (vegetative or flower), and arrangement
- describe bark characteristics, such as, furrowed, smooth, plate-like, etc.
- describe leaves using botanical terminology and distinguish a range of inflorescence type and fruit to aid in plant identification

**Achievement Criteria:**

Given 20 plants (wide range) the apprentice will identify and describe using family, botanical, and common names. Will correctly identify 14 or more plants.

**LINE B: DEMONSTRATE EFFECTIVE SUPERVISION**

**Competency: B1 Demonstrate supervisory skills based on time and stress management, ethics, communication, power and teams.**

**Learning Objectives:**

- 1 Apprentices will study the basic theories of supervision and demonstrate the skills associated with effective supervision. These include: time management, dealing with stress, ethics and social responsibility in the workplace, effective communication, use of power, and characteristics of effective teams.

<b>Learning Tasks</b>	<b>Content</b>
1 Manage time	<ul style="list-style-type: none"><li>• demonstrate ability to manage personal and work time effectively</li></ul>
2 Manage stress	<ul style="list-style-type: none"><li>• demonstrate ability to use stress management techniques on the job</li></ul>
3 Recognize ethical and social responsibility issues in the work place	<ul style="list-style-type: none"><li>• determine the ethical and social consequences of work-place practices</li></ul>
4 Communicate effectively	<ul style="list-style-type: none"><li>• identify and use verbal and non-verbal communication techniques</li></ul>
5 Manage conflict	<ul style="list-style-type: none"><li>• manage job site conflicts between team members, businesses, and clientele</li></ul>
6 Apply the concept of power in an organization and practice power relationships	<ul style="list-style-type: none"><li>• recognize power structure in the organization and how to apply power within the organization</li></ul>
7 Describe characteristics of an effective team	<ul style="list-style-type: none"><li>• recognize characteristics of team members and how they relate to high-performance teams</li></ul>

**Achievement Criteria:**

The apprentice will correctly answer 7 or more multi-choice questions out of 10 on the skills associated with effective management. The apprentice will also be evaluated on the ability to illustrate supervisory skills through in class case examples and achieve a 70% or higher assessment.

**LINE C: PRACTICE EQUIPMENT MAINTENANCE AND SAFETY**

**Competency: C1 Practice maintenance on small one-cylinder engines and horticulture hand tools. Demonstrate personal safety in the workplace and identify fire types and extinguishing methods.**

**Learning Objectives:**

- 1 Apprentices will learn basic maintenance on small one-cylinder engines and equipment as applied to horticulture. They will be introduced to engine designs and functions.
- 2 Apprentices will apply safe work practices as to related horticulture equipment. They must successfully complete the WHMIS certificate to pass this course.

**Learning Tasks**

- 1 Describe the Workers Compensation Act in the work place (WorkSafeBC)
- 2 Summarize Workplace Hazardous Material Information System (WHMIS)
- 3 Describe and demonstrate personal safety in the workplace
- 4 Identify fire types and extinguishing methods
  
- 5 Use hand tools to maintain horticulture equipment
  
- 6 Identify engine components and function
  
- 7 Practice preventive maintenance and troubleshooting procedures
- 8 Describe safe operating procedures for horticulture equipment

**Content**

- summarize basic WorkSafeBC core requirements
- complete an on-line WHMIS certificate
  
- demonstrate personal safety and the use of personal protective equipment
- examine water, foam, or chemical extinguishing methods
- distinguish between paper, oil and gas, or electrical fires.
- use sockets and wrenches to remove and install parts
- show competency in using an ignition tester, tachometer, torque wrench, and feeler gauges
- identify the differences of a two-stroke, four-stroke, and hybrid four-stroke engines
- identify the carburetor, ignition system, starter components, piston, and compression.
- tune up equipment and diagnose worn or defective parts.
- safely operate string trimmers, lawnmowers, and backpack blowers
- practice starting, stopping, and adjusting equipment

**Achievement Criteria:**

Given a 15 question quiz, the apprentice will be able to demonstrate the knowledge of maintenance, design and function of a small one-cylinder engines and equipment as applied to horticulture, by answering correctly 11 or more questions.

The apprentice will also be required to successfully complete and pass the WHMIS certificate.

**LINE D: DESCRIBE PLANT SCIENCE AS IT APPLIES TO HORTICULTURE**

**Competency: D1 Explain plant morphological characteristics, life cycles, and adaptations as they apply to plant identification, plant propagation, arboriculture and turf maintenance.**

**Learning Objectives:**

- 1 Apprentices will examine various shapes and arrangements of stems, leaves, flowers, and fruits. Botanically descriptive terms commonly used in horticulture will be used.
- 2 They will cover the life cycle of a temperate flowering plant. Stem, root, and leaf modifications and adaptations to environmental conditions will be studied.
- 3 They will acquire basic horticulture botanical knowledge that will assist them with their studies in plant identification, plant propagation, arboriculture and turf maintenance.

<b>Learning Tasks</b>	<b>Content</b>
1 Describe the external parts of herbaceous and woody stems	<ul style="list-style-type: none"><li>• use the features of a stem (leaf scar shape, bud shape and position, etc.) to assist with identification of that plant</li><li>• locate the appropriate parts of a stem or branch for pruning, propagation (grafting, cuttings) and other horticultural purposes</li></ul>
2 Describe the parts of a leaf and variations in shape	<ul style="list-style-type: none"><li>• identify the difference between simple and compound leaves and the arrangement of leaflets within a compound leaf</li><li>• group plants into specific plant families and aid in plant identification by recognizing the arrangement of veins within each leaf or leaflet</li></ul>
3 Describe parts of the flower	<ul style="list-style-type: none"><li>• identify the basic parts of a flower in preparation for the study of sexual reproduction of flowering plants</li></ul>
4 Identify typical inflorescences	<ul style="list-style-type: none"><li>• categorize inflorescence types as an aid in plant identification</li></ul>
5 Identify typical fruits	<ul style="list-style-type: none"><li>• separate fruit types into botanical categories as an aid in plant identification</li></ul>
6 Describe the stages in the life cycle of a flowering plant	<ul style="list-style-type: none"><li>• describe the events that lead to development of hybrid or open-pollinated seed</li></ul>
7 Describe parts of a seed and seedling	<ul style="list-style-type: none"><li>• identify viable seed that produce healthy and vigorous seedlings</li></ul>
8 Identify stem, root, and leaf modifications	<ul style="list-style-type: none"><li>• recognize various plant types, often grouped in the category “bulbs”, that are commonly available for gardens and nurseries and are propagated vegetatively</li><li>• identify atypical stem and leaf features for plant identification purposes</li></ul>
9 Identify plant adaptations to environmental effects	<ul style="list-style-type: none"><li>• recognize plant growth habits or modifications that are specifically adapted to certain environments</li></ul>

### **Learning Tasks**

- 10 Describe basic growth responses to plant hormones

### **Content**

- recognize plant growth responses as a result of change in environment, horticultural practice, or plant development
- identify the hormone that is most likely responsible for a particular growth response.

### **Achievement Criteria:**

Given a 20 question/diagram quiz, the apprentice will be able to illustrate their basic botanical knowledge by answering 14 or more correctly.

**LINE E: DESCRIBE PLANT HEALTH AND PEST MANAGEMENT**

**Competency: E1 Identify signs and symptoms of living and non-living factors that cause plant stress.**

**Learning Objectives:**

- 1 Apprentices will study the main types of plant stress and their causes. They will identify signs and symptoms of living and nonliving factors on plants including the environmental conditions that are conducive to plant stress.
- 2 Apprentices will inspect and describe pest, disease and weed samples.
- 3 Apprentices will be introduced to Integrated Pest Management (IPM) and its use in the horticulture industry.

<b>Learning Tasks</b>	<b>Content</b>
1 Define plant stress	<ul style="list-style-type: none"><li>• able to identify a range of symptoms of plant stress and begin to link symptoms to either abiotic or biotic causes</li></ul>
2 Describe conditions that lead to plant stress	<ul style="list-style-type: none"><li>• able to identify a range of symptoms of plant stress and begin to link symptoms to either abiotic or biotic causes</li></ul>
3 Distinguish between biotic and abiotic causes of plant stress	<ul style="list-style-type: none"><li>• able to identify a range of symptoms of plant stress and begin to link symptoms to either abiotic or biotic causes</li></ul>
4 Recognize common indicators of abiotic plant stress	<ul style="list-style-type: none"><li>• able to identify a range of symptoms of plant stress and begin to link symptoms to either abiotic or biotic causes</li></ul>
5 Identify the major plant pest types including plant feeding pests, diseases, and weeds	<ul style="list-style-type: none"><li>• categorize plant pest types and broadly associate the symptoms of biotic plant stress with the type of plant pest</li></ul>
6 Recognize damage caused by various pests	<ul style="list-style-type: none"><li>• categorize plant pest types and broadly associate the symptoms of biotic plant stress with the type of plant pest</li></ul>
7 Describe life stages of example pests	<ul style="list-style-type: none"><li>• outline the lifecycle of typical pests with a focus on damaging stages and stages where effective controls can be implemented</li></ul>
8 Describe basic arthropod morphology	<ul style="list-style-type: none"><li>• describe basic arthropod morphology using appropriate terminology and identify typical examples of arthropods to order</li></ul>
9 Identify eight orders of insects	<ul style="list-style-type: none"><li>• describe basic arthropod morphology using appropriate terminology and identify typical examples of arthropods to order</li></ul>
10 Identify four types of plant-pathogens (viruses, fungi, bacteria, and nematodes)	<ul style="list-style-type: none"><li>• link signs and symptoms to the different categories of pathogens</li></ul>
11 Describe the characteristics that make plants weeds	<ul style="list-style-type: none"><li>• list the characteristics that result in the plants being treated as weeds in horticultural operations</li></ul>
12 Describe established methods for controlling pests (IPM)	<ul style="list-style-type: none"><li>• outline the steps and processes in an integrated pest management program</li></ul>

**Achievement Criteria:**

Given 10 plant and pest samples, the apprentice will successfully answer 7 or more correctly by identifying the signs and symptoms of living and non-living factors conducive to plant stress.

**LINE F:                   MANAGE SOILS**

**Competency:       F1     Describe physical and biological characteristics of soil, and soil-less media.**

**Learning Objectives:**

- 1 Apprentices will recognize soil and soil management as keys to the successful practice of horticulture.
- 2 They will study soil formation, the physical and biological properties of soils, and soilless media as they relate to use, soil quality, and plant growth.
- 3 They will examine soils, assess some physical and biological properties of soils and interpret test results.

**Learning Tasks**

1 Define soil

2 Define soil quality

3 Describe a soil profile

4 Explain the physical properties soil and soilless media

5 Describe the behaviour of water in soil

6 Outline the key soil biological processes and their effects on plant growth and soil quality

**Content**

- define a natural soil body and contrast it to soil material or soilless media
- natural soil bodies are the result of soil forming processes (additions, losses, transformations and translocations) as influenced by soil forming factors (climate, time, biota, parent material, topography)
- define soil from a variety of perspectives particularly as a medium for plant growth
- define soil quality and discuss the importance of soil quality, relative to plant growth and environmental sustainability
- use colour, structure, texture, rooting, and consistence to describe the soil horizons that comprise a soil profile
- discuss the differences between layers of soil materials and soil horizons
- assess soil physical properties (texture, structure, density, porosity) and discuss soil physical properties and their alteration relative to plant growth and soil quality
- the role of particle size and particle size distribution is emphasized.
- measure soil water content and assess the soil's capacity to retain and transmit water relative to plant growth and soil quality
- discuss the importance of the abundance, distribution, and activity of the major groupings of soil organisms relative to plant growth and soil quality

### **Learning Tasks**

- 7 Explain the role of organic matter in soil
- 8 Describe composting methods

### **Content**

- describe the basic composition of soil organic matter and the key roles of soil organic matter relative to soil chemical and physical behaviour
- describe the composting process and the characteristics and uses of quality compost in horticulture

### **Achievement Criteria:**

The apprentice will examine soil samples and describe physical and biological properties of soils and their effects on plant growth by achieving a passing grade of 70% on a combination written/practical assessment

**LINE H: PRACTICE HORTICULTURAL SKILLS**

**Competency: H1 Demonstrate basic horticultural skills**

**Learning Objectives:**

- 1 Apprentices will be introduced to and practice basic skills used in general horticulture.
- 2 They will learn procedures for identifying, selecting, using, and maintaining hand tools.
- 3 Apprentices will develop safe work habits and apply practical skills by maintaining beds, borders, lawns, nurseries, and containers on campus.
- 4 They will practice safe operation of common power equipment.
- 5 Apprentices will identify levels of landscape maintenance and plant standards stated in the BC Landscape Standard.

**Learning Tasks**

- 1 Identify hand tools used in basic horticulture
- 2 Select and use hand tools in horticulture
- 3 Perform basic horticulture tasks
- 4 Operate horticulture power equipment safely and effectively
- 5 Recognize a range of workplace hazardous
- 6 Apply appropriate safety procedures when practicing horticulture operations
- 7 Demonstrate safe work practices when lifting and bending
- 8 Demonstrate the importance of cooperative work methods
- 9 Perform basic calculations

**Content**

- Identify hand tools used in basic horticulture
- Select and use hand tools in horticulture
- Perform basic horticulture tasks
- Operate horticulture power equipment safely and effectively
- Recognize a range of workplace hazardous
- Apply appropriate safety procedures when practicing horticulture operations
- Demonstrate safe work practices when lifting and bending
- Demonstrate the importance of cooperative work methods
- Perform basic calculations

**Achievement Criteria:**

The apprentice will demonstrate knowledge of safe work habits and apply practical horticulture skills by maintaining beds, borders, lawns, nurseries, and containers on campus. They will achieve a passing grade of 70% or higher on a practical assessment.

# **PROGRAM OUTLINE FOR LEVEL 2**

**LINE A: DEMONSTRATE THE ABILITY TO IDENTIFY PLANTS AND DESCRIBE THEIR USE**

**Competency: A2 Practice plant identification skills to identify plants used in all segments of horticulture. Identify plants suitable for planting in difficult situations.**

**Learning Objectives:**

- 1 Apprentices will practice skills that will enable them to identify a wide range of plants used in all segments of horticulture including examples of trees, shrubs, vines, groundcovers, bedding plants house plants, cut flowers, weeds, and invasive plants.
- 2 They will study the important plant characteristics of leaves, buds, flowers, fruits, plant shapes, and branching patterns, and will learn about species suitable for planting in difficult situations.

**Learning Tasks**

- 1 Identify and describe 75 woody and non-woody plants
- 2 Employ correct naming and plant identification terminology
- 3 Name the plant family for each plant identified
- 4 Recognize a range of plant materials commonly used in commercial horticulture
- 5 Recognize plants suitable for planting in difficult situations
- 6 Recognize and describe bud, bark, foliage, flower, and fruit characteristics

**Content**

- identify and describe, using botanical terms, 75 woody and non-woody plants
- identify and describe each plant according to its cultural and maintenance requirements
- use binomial nomenclature and botanical terminology to correctly name plants according to the Royal Horticultural Society standard for nomenclature
- correctly name the plant family for each plant identified according to the Royal Horticultural Society standard for nomenclature
- recognize the plant material common to nursery, landscape, and floriculture
- recognize plant material suitable for planting in difficult situations such as, shady, poorly drained, and droughty, locations
- describe bud characteristics, such as, morphology, type (vegetative or flower), and arrangement
- describe bark characteristics, such as furrowed, smooth, plate-like, etc.
- describe leaves using botanical terminology and distinguish a range of inflorescence type and fruit to aid in plant identification

**Achievement Criteria:**

Given 20 plants (wide range) the apprentice will identify and describe using family, botanical, and common names. Will correctly identify 14 or more plants.

**LINE B: DEMONSTRATE BASIC SUPERVISION**

**Competency: B2 Demonstrate supervisory skills based on leadership, motivation, and delegation. Describe safety management and managing in a diverse workplace.**

**Learning Objectives:**

- 1 Apprentices will study the basic theories of supervision and demonstrate the skills associated with effective supervision. These include: leadership, motivation, delegation, safety management, and managing in a diverse workplace.

<b>Learning Tasks</b>	<b>Content</b>
1 Practice leadership in the organization	<ul style="list-style-type: none"><li>• lead a workplace team by the effective use of motivation, delegation, and team management</li></ul>
2 Apply motivational techniques	<ul style="list-style-type: none"><li>• motivate workers under their direction</li></ul>
3 Describe safety culture	<ul style="list-style-type: none"><li>• describe the safety culture of their organization</li></ul>
4 Manage a diverse work-place	<ul style="list-style-type: none"><li>• recognize and manage diversity</li></ul>
5 Interpret the employment standards act	<ul style="list-style-type: none"><li>• describe the impacts of the Employment Standards Act on horticultural operations</li></ul>

**Achievement Criteria:**

The apprentice will correctly answer 14 or more multi-choice questions out of 20 on the skills associated with effective management. The apprentice will also be evaluated on the ability to illustrate supervisory skills through in class case examples and achieve a 70% or higher assessment.

**LINE C: PRACTICE EQUIPMENT MAINTENANCE AND SAFETY**

**Competency: C2 Practice maintenance on multiple cylinder engines. Describe safe operating procedures for horticulture equipment.**

**Learning Objectives:**

- 1 Apprentices will learn basic maintenance on larger multiple cylinder engines and equipment as applied to horticulture.
- 2 They will be introduced to engine designs and functions.
- 3 They will apply safe work practices as to related horticulture equipment.

**Learning Tasks**

- 1 Describe and demonstrate safe lifting and moving techniques
- 2 Describe and demonstrate personal safety as related to large multiple cylinder equipment
- 3 Recognize workplace hazards
- 4 Use hand tools to maintain horticulture equipment
- 5 Identify engine components and function
- 6 Practice preventive maintenance and troubleshooting procedures
- 7 Describe safe operating procedures for Horticulture equipment

**Content**

- lift batteries from floor to the engine compartment
- remove and rotate tires
- demonstrate entry onto and exit from machinery using the three point contact
- wear appropriate safety equipment.
- recognize workplace hazards and mitigate the risk of accident and injury
- use sockets and wrenches to remove and reinstall parts
- demonstrate the use of a multimeter, battery charger, tire gauge, and hydrometer
- identify the differences between a diesel engine and a 2-stroke or 4-stroke engine
- identify the carburetor, alternator, radiator, piston, and compression.
- tune up equipment and diagnose worn or used parts
- operate a skid steer and zero turn walk behind machine
- practice connecting attachments

**Achievement Criteria:**

Given a 20 question quiz, the apprentice will be able to demonstrate the knowledge of safety, maintenance, design and function on multiple cylinder engines and equipment as applied to horticulture, by answering correctly answering 14 or more questions.

**LINE D: DESCRIBE PLANT SCIENCE AS IT APPLIES TO HORTICULTURE**

**Competency: D2 Examine the internal anatomy of stems, roots and leaves as they related to photosynthesis, respiration, and transpiration.**

**Learning Objectives:**

- 1 Apprentices will examine the internal anatomy of stems, roots, and leaves in order to appreciate their function.
- 2 They will relate the processes of photosynthesis, respiration, and transpiration to environmental influences commonly found in landscapes and production facilities.
- 3 Various growth responses to external stimuli, such as gravity and photoperiod, will also be studied.

**Learning Tasks**

- 1 Describe the internal anatomy of stems, roots, and leaves
- 2 Describe the movement of sap through a plant and the effects of environment on the rate of flow
- 3 Describe the flow of sugars, produced in photosynthesis, through the plant
- 4 Explain the influence of temperature, water availability, and light on the rates of photosynthesis and respiration

**Content**

- identify the vascular cambium within a woody stem
- recognize root hairs on newly formed root tips, locate tissues which conduct water up stems to the leaves and transport sugars down to the roots for storage or to the growing tips for new cell development
- recognize tissues (leaves and green stems) that photosynthesize
- follow the flow of water from the root tips to the stomata openings in leaves
- appreciate that transpirational flow is a “pull” mechanism and distributes water and nutrients throughout the plant
- recognize the effects of environmental conditions on water use by the plant
- follow the flow of sugar from the leaves to various parts of the plant to be stored as starch in the roots or to be used immediately for cell maintenance and growth
- appreciate the conversion of sunlight to sugar via photosynthesis and the subsequent release of energy via respiration to be used in plant growth and cell maintenance
- relate the effects of environmental conditions (day length, light intensity, temperature, air flow, availability of water, relative humidity) on the rates of photosynthesis, respiration, and transpiration
- discuss how the rates of those processes affect growth

**Learning Tasks**

- 5 Describe the growth response to external stimuli

**Content**

- recognize plant growth responses to external stimuli such as gravity and photoperiod

**Achievement Criteria:**

Given a 20 question/diagram quiz, the apprentice will be able to illustrate their basic botanical anatomy knowledge by answering 14 or more correctly.

**LINE E: DESCRIBE PLANT HEALTH AND PEST MANAGEMENT**

**Competency: E2 Examine biological characteristics of weeds, plant feeders and pathogens and list control strategies**

**Learning Objectives:**

- 1 Apprentices will study the three major plant pest types (weeds, plant-feeders, and pathogens).
- 2 They will examine the biological characteristics of pests, their effects on plants, and list various integrated strategies available for controlling them. These strategies will include an overview of cultural, biological, and chemical control tactics for each of the plant pest types.

**Learning Tasks**

- 1 Describe and distinguish between the major plant pest types (weeds, plant-feeders & pathogens)
- 2 Describe characteristics that make plants weeds
- 3 Describe characteristics that make vertebrates pests
- 4 Describe characteristics that make invertebrates pests
- 5 Describe characteristics that make pathogens pests
- 6 Describe the principles of cultural, biological and chemical control methods as applied to horticultural plant pests
- 7 Describe the integrated strategies and tactics for the control of major plant pest types

**Content**

- report on the characteristics that result in organisms being categorized as pests
- report on the characteristics that result in organisms being categorized as pests
- report on the characteristics that result in organisms being categorized as pests
- report on the characteristics that result in organisms being categorized as pests
- report on the characteristics that result in organisms being categorized as pests
- report on the principles (advantages and disadvantages) of pest control
- classify a variety of control measures as belonging to the broad categories of cultural, biological, or chemical pest control
- link strategies for integrated control to the tactics of pest control
- discuss the nature and complexity of integration (the effects of specific tactics on non-target pests and other organisms)

**Achievement Criteria:**

Given a 20 questions quiz, the apprentice will successfully answer 14 or more correctly by identifying biological characteristics of pests, the cultural, biological and chemical control methods applied to pests.

**LINE F:                   MANAGE SOILS**

**Competency:       F2     Describe chemical characteristics of soil and soil-less media.**

**Learning Objectives:**

- 1 Apprentices will continue their studies of soil and soil management in horticulture.
- 2 They will study the chemical properties of soil and soilless media (soil reaction, soil salinity, soil fertility).
- 3 Apprentices will sample soils.

**Learning Tasks**

- 1 Describe how soil colloids (silicate clays, oxide clays, humus) determine soil chemical properties
- 2 Measure soil reaction
- 3 Manage soil reaction
- 4 Explain how soil reaction relates to soil fertility
- 5 Measure and manage salinity and sodicity
- 6 Explain how soil salinity and sodicity affect soil properties
- 7 Discuss the behaviour of nutrients, particularly nitrogen, phosphorus, and potassium, in the soil

**Content**

- describe the basic kinds of soil colloids and recognize the role that soil colloids play in soil fertility and nutrient behaviour
- discuss the relationship between cation exchange capacity and inherent fertility.
- measure soil pH using a variety of techniques including potentiometric and colourimetric methods
- examine the relationship of soil composition and soil pH to the lime requirement of acid soils
- select liming materials based on calcium carbonate equivalent and fineness of the liming material
- calculate application rates of lime given soil test information
- discuss the impact of soil reaction on nutrient availability and on plant growth
- identify the key soil management operations that alter soil pH
- measure electrical conductivity of soils and soilless media
- classify soils according to electrical conductivity and sodium content
- describe the impact of salinity and sodicity (poor drainage, high electrical conductivity, poor soil structure) on soil quality and plant growth
- outline the strategies that can ameliorate soil salinity problems
- list the available forms of nutrients in the soil and the main pools or sources of nutrients
- examine the nitrogen cycle from the standpoint of plant available nitrogen and environmental quality

<b>Learning Tasks</b>	<b>Content</b>
8 Identify the processes by which plants acquire nutrients	<ul style="list-style-type: none"> <li>• describe the methods of nutrient movement to plant roots and the influences of soil properties on nutrient uptake</li> </ul>
9 Discuss nutrient management	<ul style="list-style-type: none"> <li>• describe the main sources of nutrient loss from soils and the impacts on plant growth and environmental quality</li> <li>• discuss strategies for minimizing nutrient loss</li> </ul>
10 Sample soils	<ul style="list-style-type: none"> <li>• design a sampling plan and collect samples for testing</li> </ul>
11 Interpret soil test information	<ul style="list-style-type: none"> <li>• read a soil report and implement recommendations</li> </ul>
12 Interpret fertilizer label information	<ul style="list-style-type: none"> <li>• determine nutrient sources, fertilizer ratios, fertilizer application rates, and recommended method of applying fertilizer from the label and by calculation</li> </ul>

**Achievement Criteria:**

The apprentice will examine soil samples and identify the chemical properties and achieve a passing grade of 70% on a combination written/lab assessment.

**LINE H: PRACTICE HORTICULTURAL SKILLS**

**Competency: H2 Assess plant quality and demonstrate plant-handling requirements.**

**Learning Objectives:**

- 1 Apprentices will gain practical experience in basic landscape and production nursery stock operations.
- 2 They will study plant quality assessment and handling requirements for common ornamental plant material used in the landscape and nursery industries.
- 3 Apprentices will practice loading and unloading, sorting, grading, and other types of handling of ornamental plant material.

**Learning Tasks**

- 1 Perform plant-grading according to the Canadian Standard for Nursery Stock and the British Columbia Landscape Standard
- 2 Identify containers used for growing and shipping ornamental plant material
- 3 Describe standards for root ball sizing
- 4 Prepare balled and burlapped plants
  
- 5 Securely load plant material
- 6 Demonstrate proper planting procedures
  
- 7 Safely operate truck and trailer

**Content**

- assess and grade plants according to plant foliage density, calliper, height, and width ratios according to the standards
- calculate container volume and compare results to the standards
- calculate root ball sizes for containers and field grown stock
- demonstrate digging, wrapping, and tying of root balls
- safely and efficiently lift and carry plant material to avoid physical damage to themselves and the plants
- discuss different methods of harvesting plant material for field grown stock
- safely load, unload, and secure plant material on a truck
- determine the appropriate depth and width of the planting hole
- place the plant in the hole and back fill with the appropriate soil material
- discuss appropriate post-planting maintenance requirements
- demonstrate how to safely couple the truck / tractor and trailer and operate either combination in reverse and securely park the vehicle
- perform these operations in compliance with the guidelines established in the Certified Horticulture Technician Program (CHT)

**Achievement Criteria:**

The apprentice will demonstrate knowledge of safe work habits and apply practical horticulture skills by handling a range of ornamental plant material. They will achieve a passing grade of 70% or higher on a practical assessment.

# **PROGRAM OUTLINE FOR LEVEL 3**

**LINE A: DEMONSTRATE THE ABILITY TO IDENTIFY AND DESCRIBE PLANTS AND DESCRIBE THEIR USE**

**Competency: A3 Practice plant identification skills. Identify species suitable for landscape and production situations as well as tropical, floral, and indoor landscapes.**

**Learning Objectives:**

- 1 Apprentices will practice skills that will enable them to identify a wide range of plants used in all segments of horticulture including examples of trees, shrubs, vines, groundcovers, perennials, bedding plants, house plants, cut flowers, weeds, and invasive plants.
- 2 They will study the important plant characteristics of leaves, buds, flowers, fruits, plant shapes and branching patterns, and will learn about species suitable for a range of landscape and production situations as well as common tropical, floral, and interior landscape situations.

**Learning Tasks**

- 1 Identify and describe 90 woody and non-woody plants
- 2 Employ correct naming and plant identification terminology
- 3 Name the plant family for each plant identified
- 4 Recognize a range of plant materials commonly used in commercial horticulture
- 5 Recognize plants suitable for common tropical, floral, and interior landscape situations
- 6 Recognize and describe bud, bark, foliage, flower, and fruit characteristics

**Content**

- identify and describe, using botanical terms, 90 woody and non-woody plants
- identify and describe each plant according to its cultural and maintenance requirements
- use binomial nomenclature and botanical terminology to correctly name plants according to the Royal Horticultural Society standard for nomenclature
- correctly name the plant family for each plant identified according to the Royal Horticultural Society standard for nomenclature
- recognize the plant material common to nursery, landscape, and floriculture
- recognize plant material suitable for interior landscaping as well as house plants and floral uses such as cut flowers
- describe bud characteristics, such as, morphology, type (vegetative or flower), and arrangement
- describe bark characteristics, such as, furrowed, smooth, plate-like, etc.
- describe leaves using botanical terminology and distinguish a range of inflorescence type and fruit to aid in plant identification

**Achievement Criteria:**

Given 15 woody plants and 15 non-woody plants the apprentice will identify and describe using family, botanical, and common names. Will correctly identify 21 or more plants.

**LINE E: DESCRIBE PLANT HEALTH AND PEST MANAGEMENT**

**Competency: E3 Explain the management of insect, weed, disease, mollusc and vertebrate pests in landscapes.**

**Learning Objectives:**

- 1 Apprentices will study the management of insect, weed, disease, mollusc, and vertebrate pests of landscapes (hardscapes, general plantings, turf, and trees and shrubs).
- 2 They will describe conditions favourable for pest development and apply the principles of IPM in their management.
- 3 Basic concepts of biological control will be taught in addition to an introduction to exotic and invasive pests.
- 4 Apprentices will present the outcome of their IPM program from a real workplace situation and provide a written report in the form of an IPM plan.

**Learning Tasks**

- 1 Identify 5 common insects, diseases, weeds, mollusc, and vertebrate pests of landscapes
- 2 Recognize the differences between biotic and abiotic plant symptoms
- 3 Describe the relationship between plant health and occurrence of landscape pests
- 4 Describe biological, chemical, cultural, mechanical, and physical controls for landscape pests
- 5 Describe how exotic and invasive pests impact pest management

**Content**

- identify 5 common diseases, weeds, mollusc, and vertebrate pests by sight recognition
- distinguish between biotic and abiotic plant health symptoms
- describe the relationship between plant health and occurrence of pests and diseases on landscape plants
- identify biological, chemical, cultural, mechanical and physical controls for landscape pests.
- recognize the impact of invasive alien pests on landscape sites

**Achievement Criteria:**

Given a 20 question quiz on management of insect, weed, disease, mollusc, and vertebrate pests in the landscape the apprentice will correctly answer 14 or more questions. The apprentice will also be evaluated on a true IPM workplace written report to a standard of 70% assessment.

**LINE F:                   MANAGE SOILS**

**Competency:        F3     Asses landscape sites with respect to soils**

**Learning Objectives:**

- 1 Apprentices will apply soil quality and soil management principles to the assessment of in situ native soil, disturbed native soil, and manufactured soil in the landscape.
- 2 They will relate site characteristics, client goals, and best management practices to the installation, remediation, and management of soil and media in the landscape.

**Learning Tasks**

- 1 Apply soil quality concepts to landscape installation, landscape maintenance, and turf management
- 2 Define native soil, topsoil, top soil, and manufactured soil
- 3 Recognize native soil, topsoil, top soil, and manufactured soils in the field
- 4 Discuss growing media designations and growing media specifications
- 5 Use growing media specifications to assess potential media sources

**Content**

- recognize the three elements of soil quality (biological productivity, environmental quality, and plant and animal health) that are key client and societal goals
- analyze soil composition and landscape plant performance against the elements of soil quality
- develop a framework for soil management decisions in landscape horticulture
- define soil, topsoil, top soil and manufactured soil based on key characteristics such as origin, colour, structure, and texture.
- predict plant performance based on soil characteristics and develop best management practices for the site
- define soil, topsoil, top soil, and manufactured soil based on key characteristics such as origin, colour, structure, and texture
- predict plant performance based on soil characteristics and develop best management practices for the site
- evaluate landscape sites and recommend growing media using the BCLNA / BCSLA Landscape Standard recommendations for planting media given the type of plants and a quality or intensity of use factor
- understand the unique media requirements for standard landscape plantings, specialty plantings such as containers, sports fields, golf or bowling greens, or green roofs
- evaluate landscape sites and recommend growing media using the BCLNA / BCSLA Landscape Standard recommendations for planting media given the type of plants and a quality or intensity of use factor

## Learning Tasks

- 6 Recommend growing media for landscape installations
- 7 Sample a range of soil, topsoil, top soil, and manufactured soil
- 8 Interpret soil test reports
- 9 Discuss soil amendments for their effects on soil chemical and soil physical quality
- 10 Describe the procedures for installing growing media at a new landscape site
- 11 Outline the procedures for amending growing media in an established landscape

### Achievement Criteria:

The apprentice will apply soil management and installation principles to the assessment of a landscape site and achieve a passing grade of 70% on a combination written/lab assessment.

## Content

- understand the unique media requirements for standard landscape plantings, specialty plantings such as containers, sports fields, golf or bowling greens, or green roofs
- evaluate landscape sites and recommend growing media using the BCLNA / BCSLA Landscape Standard recommendations for planting media given the type of plants and a quality or intensity of use factor
- understand the unique media requirements for standard landscape plantings, specialty plantings such as containers, sports fields, golf or bowling greens, or green roofs
- recognize a range of soil, topsoil and manufactured soil.
- determine how many subsamples, how to collect samples, the depth of sampling, and the supporting information that is necessary for successful soil sampling
- calculate the amounts of nutrients or amendments required to bring a soil to acceptable levels of fertility
- select soil amendments based on the properties of the soil to be amended (from the soil test report), the desired goal, and the cost
- discuss the advantages and disadvantages of common inorganic and organic amendments in relation to altering soil physical properties and soil chemical properties
- assess site characteristics such as the nature of the subsoil, the bulk density of the subsoil, the slope of the subsoil, the contamination of the subsoil with building debris or coarse fragments as they affect the procedures and costs of installing media
- describe procedures for preventing soil layering and ensuring the new media is installed to the correct bulk density
- amend inferior soils without disturbing established plants including the general techniques of topdressing or cultivation

**LINE G:                   MANAGE PLANTS IN THE LANDSCAPE**

**Competency:       G1     Demonstrate basic pruning of trees, shrubs, groundcovers and vines.**

**Learning Objectives:**

- 1 Apprentices will study the purpose and outcomes of pruning young and established woody plant material.
- 2 They will examine the range of pruning techniques and their effects on woody ornamentals.
- 3 Planting and transplanting techniques will be introduced.
- 4 Using common arboriculture hand tools, students will gain practical experience in pruning trees, shrubs, groundcovers, and vines.

**Learning Tasks**

- 1 Describe the purpose of pruning trees, shrubs, and groundcovers
  
- 2 Review basic plant morphology, anatomy, and physiology with regard to pruning
  
- 3 Prepare specifications for pruning established trees
  
- 4 Identify the four zones of compartmentalization

**Content**

- discuss plant health and vigor, directing or modifying growth habits, and enhancing fruit and flower production as reasons for pruning woody ornamentals
- list and describe factors such as plant form, function, age, location, timing, and alternatives to pruning on the decision to prune
- identify canopy, trunk or main stem, scaffold and lateral branches, and roots of a tree
- identify branch and trunk collars on trees
- summarize the importance of branch attachment and size and how the mechanics of tree form relate to pruning decisions
- document pruning specifications to develop and preserve tree structure
- provide itemized working guidelines for pruning trees which are dependant on species and individual tree qualities such as size, age, location, condition, and function
- include such items as pruning objectives, type and sizes of cuts performed, reasons for pruning, pruning dose, pruning guidelines, and safety practices
- identify the four zones of compartmentalization in response to damage
- describe the function and basic physiological responses of these internal structures

### **Learning Tasks**

- 5 Demonstrate common pruning techniques for trees, shrubs, groundcovers, and vines
- 6 Demonstrate common training techniques for young trees
- 7 Transplant ornamental woody plants
- 8 Safely operate common arboriculture equipment and tools

### **Content**

- demonstrate heading and thinning cuts on a variety of woody ornamentals
- summarize pruning practices of cleaning, thinning, crown raising, reduction and restoration
- summarize the negative consequences of topping woody ornamentals
- summarize the importance of early development of structurally strong trees
- demonstrate techniques that affect the development of trunk taper, scaffold spacing, and plant form
- describe planting techniques for planting in well-drained and water retentive soils
- demonstrate proper lifting, handling, and planting of small (#2) and large (B&B) plant material
- summarize and demonstrate staking and guying of newly planted woody ornamentals
- safely demonstrate the use of a variety of hand and power tools commonly used in arboriculture practice
- practice three-point contact as it relates to ladder safety
- practice in maintaining and sharpening hand-held by-pass pruners

### **Achievement Criteria:**

Given a 20 questions quiz on practical assessment of basic pruning of tree, shrubs, groundcovers and vines used in horticulture, the apprentice will correctly answer 14 or more questions correctly. The apprentice will also be evaluated on their pruning techniques learned through practical assessment to a standard of 70%

**LINE I: DEMONSTRATE MAINTENANCE AND INSTALLATION OF RESIDENTIAL IRRIGATION AND DRAINAGE SYSTEMS**

**Competency: I1 Demonstrate maintenance of basic residential irrigation systems. Describe the installation of simple drainage systems.**

**Learning Objectives:**

- 1 Apprentices will study and perform irrigation system maintenance for residential and commercial landscapes.
- 2 They will be introduced to irrigation components such as piping, sprinkler heads, valves, and controllers.
- 3 Pipe joining and component repair will be discussed and practiced on established irrigation systems.
- 4 The drainage section of the course will allow students to identify and install surface and sub-surface drainage systems on residential and commercial landscapes.

**Learning Tasks**

- 1 Define irrigation and drainage terms
- 2 Identify irrigation components used on residential and commercial irrigation systems
- 3 Perform practical irrigation maintenance and repairs on residential and commercial irrigation systems
- 4 Install irrigation system components
- 5 Identify common drainage components used in residential and commercial landscapes
- 6 Discuss the efficacy of surface versus sub-surface drainage systems
- 7 Install small drainage systems

**Content**

- define the range of terminology common to landscape irrigation and drainage
- identify common irrigation components such as pipe and pipe types, fittings, sprinkler heads or emission devices, valves, and controllers in accordance with Certified Horticultural Technician protocols
- repair or replace broken pipe, valves or valve components, sprinkler heads or emission devices, field wire, and controllers in accordance with Certified Horticultural Technician protocols
- install pipe, valves, sprinklers, controllers and field wires
- identify a range of surface and sub-surface drainage components common to residential and commercial landscapes
- discuss the advantages and disadvantages of surface and sub-surface drainage systems
- perform basic grading operations for surface drainage systems
- install sub-surface drainage components.

**Achievement Criteria:**

Given a 10 question quiz on all components used in the installation of irrigation and drainage systems the apprentice will correctly answer 7 or more questions

**LINE J:                    PREPARE ESTIMATES FOR BASIC LANDSCAPE  
                                  INSTALLATION PROJECTS**

**Competency:        J1        Prepare estimates for basic landscape installation  
                                  projects, perform take offs and determine costs.**

**Learning Objectives:**

- 1    Apprentices will employ the skills necessary to determine costs and prepare estimates for basic landscape installation jobs.
- 2    They will perform landscape take offs, determine perimeters, areas, and volumes.
- 3    Apprentices will calculate all costs for carrying out the work and determine levels of mark-up for risk, administration and profit.
- 4    They will also review various legal aspects of landscaping such as insurance, bonds and the BC Lien act.

**Learning Tasks**

- 1    Read a set of simple landscape plans and carry out measurements
  
- 2    Interpret landscape contract specifications
  
- 3    Calculate volumes and quantities
  
- 4    Calculate costs for landscape products and services
  
- 5    Determine the bid price for a landscape project
  
- 6    Prepare final bid documents
  
- 7    Review basic contracts

**Content**

- determine all landscape products (plants, soil, hard landscape materials etc.) required in a cost estimate by reading a set of plans
- use scale drawings to determine perimeters, areas, and volumes using manual methods and a planimeter
- read and interpret landscape contracts and specifications typically provided by landscape architects for commercial or residential projects
- calculate volumes of excavation, fill, topsoil, gravel and other materials necessary for a landscape project based on landscape plans
- calculate quantities of other products such as plants, sod, stakes, and hard landscape materials
- determine the cost of various landscape products and services such as soil, plants, gravel, and hard landscape materials
- determine the time and cost for equipment and labour
- calculate appropriate markup for risk, administration, and profit and apply these markups to the costs of the landscape project
- prepare a bid document that would be presented to a client for a small residential landscape project
- review contracts for landscape installation and maintenance work

### **Learning Tasks**

- 8 Describe various types of risk management strategies used in the landscape industry

### **Content**

- describe bid and performance and material bonds including why and when they are used
- describe typical insurance that landscapers must carry and describe the BC Lien act, including how and when it is used

### **Achievement Criteria:**

Given a typical set of landscape plans the apprentice will be able to correctly answer 7 out of 10 questions about various preparations, estimations, and calculations to carry out a landscape installation.

**LINE L: DEMONSTRATE MAINTENANCE OF TURFGRASS**

**Competency: L1 Demonstrate maintenance procedures for a variety of turfgrass situations.**

**Learning Objectives:**

- 1 Apprentices will analyze lawn quality and performance based on visual quality, functional quality, and intended use. They will apply the turf cultivation techniques that are typically practiced on residential and commercial landscape areas.
- 2 Apprentices will compare mowing techniques and operate mowers. They will determine the appropriate rate of fertilizer applications and calibrate drop and rotary spreaders.
- 3 Apprentices will discuss the establishment techniques of seeding, overseeding, and sodding. They will identify common turfgrasses based on vegetative and seed characteristics.

**Learning Tasks**

- 1 Discuss the purpose and benefits of lawns in the landscape
- 2 Assess turf quality based on visual and functional quality
- 3 Operate mowing equipment safely and effectively
- 4 Perform practical turf maintenance procedures on residential/commercial landscapes
- 5 Calibrate fertilizer and seeding equipment
- 6 Identify the most common turfgrasses used in turf maintenance

**Content**

- outline the recreational, functional, and aesthetic benefits of lawns in the landscape
- assess turf quality based on visual and functional quality
- identify the symptoms of poor lawn performance that correlate with failures in establishment or primary culture (mowing, fertilization, irrigation)
- operate 21” and intermediate size rotary mowers in accordance with Certified Horticulture Technician protocols
- introduced to the operation of reel mowing equipment.
- practice cultivation, overseeding, and topdressing lawns
- introduced to the equipment used in commercial turf operations.
- calibrate rotary and drop spreaders to deliver calculated rates of materials
- identify the most common grasses used in residential lawns based on plant and seed morphology

**Achievement Criteria:**

Given a 20 question quiz on turf grass situations, and maintenance procedures the apprentice will correctly answer 14 or more questions.

# **PROGRAM OUTLINE FOR LEVEL 4**

**LINE A: DEMONSTRATE THE ABILITY TO IDENTIFY PLANTS AND DESCRIBE THEIR USE**

**Competency: A4 Practice plant identification skills. Identify native species suitable for landscapes and common seasonal crops used in landscapes.**

**Learning Objectives:**

- 1 Apprentices will practice skills that will enable them to identify a wide range of plants used in all segments of horticulture including examples of trees, shrubs, vines, groundcovers, perennials, bedding plants, house plants, cut flowers, weeds and invasive plants.
- 2 They will study the important plant characteristics of leaves, buds, flowers, fruits, plant shapes and branching patterns, and will learn about native species suitable for planting in landscape situations as well as common seasonal crops.

**Learning Tasks**

- 1 Identify and describe 90 woody and non-woody plants
- 2 Employ correct naming and plant identification terminology
- 3 Name the plant family for each plant identified
- 4 Provide examples of native trees, shrubs, groundcovers, perennials, biennials, and annuals common to the horticulture industry
- 5 Provide examples of seasonal crops
- 6 Recognize and describe bud, bark, foliage, flower, and fruit characteristics

**Content**

- identify and describe, using botanical terms, 90 woody and non-woody plants
- binomial nomenclature and botanical terminology to correctly name plants according to the Royal Horticultural Society standard for nomenclature
- correctly name the plant family for each plant identified according to the Royal Horticultural Society standard for nomenclature
- provide examples of native trees, shrubs, groundcovers, perennials, biennials, and annuals common to commercial landscaping and nursery production
- provide examples of seasonal crops common to the ornamental horticulture industry
- Identify bud characteristics, such as, morphology, type vegetative or flower, and arrangement
- describe bark characteristics, such as furrowed, smooth, plate-like, etc.
- describe leaves using botanical terminology and distinguish a range of inflorescence type and fruit to aid in plant identification

**Achievement Criteria:**

Given 15 woody plants, 15 non-woody and 10 native plants the apprentice will identify and describe using family, botanical, and common names. Will correctly identify 28 or more plants.

**LINE E: DESCRIBE PLANT HEALTH AND PEST MANAGEMENT**

**Competency: E4 Describe the basic concepts of Integrated Pest Management in the Landscape.**

**Learning Objectives:**

- 1 Apprentices will describe the basic concepts of Integrated Pest Management (IPM) in landscapes (hardscapes, general plantings, turf, trees, and shrubs).
- 2 They will learn the basics of pest identification, describe monitoring and control techniques, and define action and aesthetic (economic) thresholds.
- 3 Apprentices will be presented with the current state of IPM in landscapes.
- 4 They will describe problems that may occur when applying an IPM strategy and plan an IPM program for their workplace.

**Learning Tasks**

- 1 Review basic principles of Integrated Pest Management (IPM)
- 2 Outline the components of IPM as they relate to the landscape
- 3 Classify a landscape according to maintenance level and pest tolerance
- 4 Determine the applicability of implementing IPM in a landscape setting
- 5 Discuss social and political implications of pest management in landscapes
- 6 Discuss how pesticides are used in IPM and their consequences
- 7 Evaluate plant health using a systemic approach to the plant diagnostics
- 8 Identify and utilize IPM resources (e.g. library, internet, professional resources)
- 9 Plan an IPM program for a landscape

**Content**

- describe the basic principles of IPM
- discuss the components of IPM within the context of landscape design and maintenance
- recognize landscape maintenance levels and pest tolerance for a given landscape site
- recommend a range of IPM practices for a given landscape site
- appreciate the relationship between pesticide use, pest management, and social attitudes toward the use of pesticides
- consider the implications of pest management at all levels of government.
- select appropriate pesticides based on a given IPM plan
- recognize a range of plant health issues and recommend treatments
- utilize a wide variety of resources to make IPM decisions
- develop an IPM plan for a given landscape

**Achievement Criteria:**

Given a 20 question quiz on basic concepts of Integrated Pest Management, the apprentice will correctly answer 14 or more questions.

**LINE G: MANAGE PLANTS IN THE LANDSCAPE**

**Competency: G2 Describe cultural management of trees, shrubs, groundcovers and vines.**

**Learning Objectives:**

- 1 Apprentices will discuss the cultural management of woody plants in the landscape.
- 2 They will explore the techniques used to diagnose common problems in ornamental plants in the landscape.
- 3 Apprentices will discuss tree preservation, winter protection, and hazard abatement practices for woody ornamental plants.
- 4 They will practice maintaining trees, shrubs, groundcovers, and vines.

**Learning Tasks**

- 1 Identify the value of trees in the landscape
- 2 Summarize the land development process and the impacts of construction on woody plants
- 3 Explain the goals of tree preservation
- 4 Recognize plant problems
- 5 Identify hazard trees
- 6 Demonstrate landscape maintenance practices that prevent disorder, disease, and decline of woody plant material

**Content**

- describe the environmental and social functions of trees
- discuss the energy conservation, pollution abatement, and storm water control properties of plants in the landscape
- summarize the economic value of trees in landscape sites
- summarize the impacts of planning, design, grading and construction, and maintenance on trees and surrounding plant growth
- describe how the long-term health and survival of trees is dependent upon the patterns of tree growth and development, and preventing injury
- identify the patterns of common damage to ornamental plant material and develop a diagnostic checklist for plants
- describe the use of common tools used by arborists to diagnose plant problems
- define what constitutes a hazard tree
- identify the factors contributing to tree failure including structural defects, plant species, size, age, and site conditions
- how past maintenance practices can impact the development of disorders leading to decline
- perform landscape functions such as edging, fertilizing, mulching, irrigating, weeding, and pruning woody plants in the landscape

**Achievement Criteria:**

Given a 20 question quiz on the cultural management of trees, shrubs, groundcovers and vines the apprentice will correctly answer 14 or more questions.

**LINE H: PRACTICE HORTICULTURAL SKILLS**

**Competency: H3 Practice installation of hardscapes.**

**Learning Objectives:**

- 1 Apprentices will practice skills that will enable them to carry out a range of landscape installations.
- 2 They will study the basic skills and techniques for the construction and installation of landscape features such as retaining walls, ponds, patios, as well as other common landscape amenities.

<b>Learning Tasks</b>	<b>Content</b>
1 Perform safe work practices	<ul style="list-style-type: none"><li>• demonstrate proper safe work practices such as the use of appropriate safety gear, proper lifting technique, safe equipment, and tool operation</li></ul>
2 Describe standards for environmental protection	<ul style="list-style-type: none"><li>• describe the precautions necessary to safeguard the environment in relation to construction site management</li></ul>
3 Describe site preparation and protection of existing site elements	<ul style="list-style-type: none"><li>• the appropriate site preparation procedures required before commencing landscape construction</li><li>• describe the necessary steps involved in environmental protection for a range of construction situations</li></ul>
4 Lay out a site from a working drawing	<ul style="list-style-type: none"><li>• use a scale, measuring tapes, and survey instruments to lay out a site from a working drawing</li></ul>
5 Locate the position of underground services on a site	<ul style="list-style-type: none"><li>• locate the position of underground services on a construction site from drawings acquired from utility authorities and by physical means</li></ul>
6 Demonstrate the use of equipment required to determine elevations and levels	<ul style="list-style-type: none"><li>• demonstrate the use of a range of equipment used to determine elevations and levels</li><li>• perform calculations associated with determining slope and calculating relative elevations.</li></ul>
7 Operate equipment to consolidate and compact a newly laid aggregate surface	<ul style="list-style-type: none"><li>• operate compacters to consolidate and compact a newly laid aggregate surface</li></ul>
8 Install hard surfaces	<ul style="list-style-type: none"><li>• determine the need for compaction.</li><li>• install a range of hard surfaces such as brick pavers, concrete, flagstone, and slate</li></ul>
9 Demonstrate the procedures necessary for the construction of a wall from a variety of materials	<ul style="list-style-type: none"><li>• demonstrate the procedures necessary for the construction of a wall from stone, segmental retaining wall systems, and wood</li></ul>

### **Learning Tasks**

- 10 Review the procedures necessary for the construction of a water feature
- 11 Describe the properties and use of hard construction materials

### **Content**

- review the process of building a water feature from start to finish including site location, levelling, plumbing, and planting
- describe the properties and use of a range of hard construction materials such as aggregates, stone, wood, and others

### **Achievement Criteria:**

The apprentice will demonstrate the basic skill and techniques for the construction and installation of hard landscape features and landscape amenities. They will achieve a passing grade of 70% or higher on a practical assessment.

**LINE I: DEMONSTRATE MAINTENANCE AND INSTALLATION OF RESIDENTIAL IRRIGATION AND DRAINAGE SYSTEMS**

**Competency: I2 Demonstrate irrigation and drainage design principles.**

**Learning Objectives:**

- 1 Apprentices will study residential, light commercial, and large-scale commercial irrigation systems from the point of view of design and use.
- 2 They will discuss design considerations and apply them to a design project.
- 3 Apprentices will discuss and assess system efficiency using irrigation auditing procedures.
- 4 The drainage section of the course will allow apprentices to evaluate surface and sub-surface drainage systems for residential and commercial landscapes.
- 5 Apprentices will assess and recommend drainage procedures for a variety of landscape situations.

**Learning Tasks**

- 1 Explain common principles of water hydraulics
- 2 Analyze design considerations for an irrigation system
- 3 Interpret an irrigation design
- 4 Program an irrigation controller to meet irrigation requirements
- 5 Perform and assess the efficiency of an irrigation system using auditing procedures
- 6 Explain irrigation start-up and winterization procedures
- 7 Assess the performance of surface and sub-surface drainage systems

**Content**

- discuss the basic considerations that effect flow and pressure
- discuss the site factors such as soil type, plant selection, site conditions (sun, shade, etc), and watering restrictions
- interpret an irrigation plan and identify components
- program a variety of irrigation controllers common to the landscape industry in accordance with Certified Horticultural Technician protocols
- perform an irrigation audit on an irrigation system
- outline winterization procedures including selection of appropriate equipment
- irrigation start-up procedures.
- evaluate site conditions and recommend remedial action

**Achievement Criteria:**

The apprentice will demonstrate the irrigation and drainage principles used in a variety of landscapes. They will achieve a passing grade of 70% or higher on a practical assessment.

**LINE K: DESCRIBE THE PRINCIPLES OF GARDEN DESIGN**

**Competency: K1 Describe the principles of garden design.**

**Learning Objectives:**

- 1 Apprentices will be introduced to landscape styles, the principles of design, the elements of design, and the design process.
- 2 They will apply the design process to hypothetical and actual site problems and discuss the application of design as it relates to use, construction, and maintenance practices.

**Learning Tasks**

- 1 Identify landscape design styles
- 2 Describe principles of landscape design
- 3 Describe elements of design
- 4 Explain the landscape design process
- 5 Evaluate landscape designs in relation to the site and their intended function
- 6 Prepare a document/portfolio to illustrate the principles of design, design elements, and landscape styles

**Content**

- identify the common landscape design styles
- describe the principles of landscape design as they relate to hard and soft landscape features
- describe the elements of design as they relate to style and design principles
- explain the design process in relation to client and site considerations
- critically evaluate simple landscape designs for their suitability to intended use
- recognize the suitability of a simple landscape design in relation to accepted construction and maintenance practices
- identify, collect, and present a range of pictures or illustrations which represent the principles of design, design elements, and landscape styles

**Achievement Criteria:**

Given a number of different landscape designs, the apprentice will be able to answer correctly answer 7 out of 10 questions on the principles of garden design. The apprentice will also develop a portfolio to illustrate design principles and achieve a passing grade of 70% or higher on a practical assessment.

**LINE L: DEMONSTRATE MAINTENANCE OF TURFGRASS**

**Competency: L2 Schedule turfgrass maintenance activities.**

**Learning Objectives:**

- 1 Apprentices will determine the maintenance requirements of medium maintenance lawns.
- 2 They will compare the requirements of medium maintenance lawns to estate lawns and sports turf.
- 3 Apprentices will practice selected turf maintenance procedures on medium maintenance lawns.
- 4 They will discuss the installation and establishment of new lawns.
- 5 Apprentices will design schedules for turf maintenance, fertilizer applications, and pest management.
- 6 They will discuss the construction materials and specifications for typical lawn establishment.
- 7 Apprentices will complete the identification of turfgrass species and seeds.

**Learning Tasks**

- 1 Discuss water use characteristics and irrigation management of turf
- 2 Discuss the establishment of lawns
- 3 Practice sod laying and the tracking of work through work orders according to the Certified Horticultural Technician protocols
- 4 Construct and evaluate an annual maintenance schedule for landscape areas

**Content**

- discuss the water use characteristics of lawns, recognize the symptoms of drought stress in turf, and recommend irrigation strategies for well watered or minimally watered lawns
- recommend adjustments to mowing, fertilization, and pest management for lawns that will not receive supplemental irrigation
- discuss the steps required to establish a lawn
- assess the impacts of site characteristics, soil quality, selection of quality seed and appropriate fertilizers, establishment technique, and post establishment care on the initial success and long term viability of the lawn
- determine the amount of sod needed for a new lawn, complete final grading, firm the site, apply appropriate starter fertilizer, lay the sod in a staggered pattern with minimal space between rolls, roll and irrigate the established lawn
- complete a work order that accurately reflects the time and materials used
- design a simple maintenance schedule for a medium maintenance lawn of moderate quality

### **Learning Tasks**

- 5 Identify cool season turfgrasses and seed species and their specific advantages and/or disadvantages for sports fields, golf courses, lawn bowls, etc.
- 6 Perform and assess turf cultivation techniques on residential and commercial lawns

### **Content**

- identify creeping and colonial bentgrasses, annual bluegrass
- review the common cool season grasses
  
- recommend the appropriate turf cultivation technique
- practice turf cultivation techniques using a vertical mower and a hollow tine aerator

### **Achievement Criteria:**

Give 20 quiz questions on turf grass maintenance and identification the apprentice will correctly answer 14 or more. The apprentice will also be evaluated on the practical application of laying sod and achieve a passing grade of 70% or higher on the assessment.

# **SECTION 3**

## **TRAINING PROVIDER STANDARDS**

## **FACILITY REQUIREMENTS LEVEL 1:**

- Classroom
- Access to live 'in situ' plant material as well as herbaria, and visual samples (slides, photographic databases, etc.)
- Access to tools and equipment listed in Section 3
- Access to a service bay and a site for equipment operation
- Botany or Science teaching lab outfitted with compound and dissecting microscopes
- Microscope slides of showing root, stem and leaf anatomy (monocot and dicot)
- Microscope slides showing woody stem growth
- Handlens (10X)
- Glassware, lamps, stir plate (with heating capacity)
- Refrigerator and microwave
- Collection of arthropods, disease organisms, and examples of plant stress
- Soil Science or Chemistry teaching lab
- Glassware, lamps, stir plate (with heating capacity)
- Refrigerator, drying oven and microwave
- Nested sieves, shakers, scales
- Hydrometers and sedimentation cylinders
- Munsell colour books
- Access to the range of hand and power tools common to the horticulture industry and a landscape and nursery site for their use and operation as listed in Section 3

## **FACILITY REQUIREMENTS LEVEL 2:**

- Classroom
- Access to live 'in situ' plant material as well as herbaria, and visual samples (slides, photographic databases, etc.)
- Access to tools and equipment listed in Section 3
- Access to a service bay and a site for equipment operation
- Botany or Science teaching lab outfitted with compound and dissecting microscopes
- Microscope slides of showing root, stem and leaf anatomy (monocot and dicot)
- Microscope slides showing woody stem growth
- Hand Lens (10X)
- Glassware, lamps, stir plate (with heating capacity)
- Collection of arthropods, disease organisms, and examples of plant stress
- Soil Science or Chemistry teaching lab
- Glassware, lamps, stir plate (with heating capacity)
- Refrigerator, drying oven and microwave
- Nested sieves, shakers, scales
- pH meters
- Soil sampling equipment
- Access to container nursery stock
- Access to field grown stock/plant material that can be prepared for transplanting
- Trailer and tractor nursery equipment
- Access to large tree transplanting equipment
- Nursery hand carts and tree dollies
- Multiple nursery stock containers
-

### **FACILITY REQUIREMENTS LEVEL 3:**

- Classroom
- Access to live 'in situ' plant material as well as herbaria, and visual samples (slides, photographic databases, etc.)
- Botany, Science or Chemistry teaching lab outfitted with compound and dissecting microscopes
- Glassware, lamps, stir plate (with heating capacity)
- Collection of arthropods, disease organisms, and examples of plant stress
- Good quality hand-lens (x10 or higher magnification)
- Access to live 'in situ' plant material for pruning
- Chipper
- Orchard ladders
- Access to plant material for planting and staking
- Soil Science teaching lab
- Glassware, lamps, stir plate (with heating capacity)
- Refrigerator, drying oven and microwave
- Nested sieves, shakers, scales
- pH meters
- Soil sampling equipment
- Access to appropriate site for installations and maintenance of irrigation and drainage
- Access to planimeters
- Landscape plans and specifications
- Scales (metric and architect)

#### **FACILITY REQUIREMENTS LEVEL 4:**

- Classroom
- Access to live 'in situ' plant material as well as herbaria, and visual samples (slides, photographic databases, etc.)
- Botany or Science teaching lab outfitted with compound and dissecting microscopes
- Glassware, lamps, stir plate (with heating capacity)
- Refrigerator and microwave
- Collection of arthropods, disease organisms, and examples of plant stress
- Good quality hand-lens (x10 or higher magnification)
- Access to a range of established and newly established woody plant material for inspection and pruning practice
- Access to commercial chipper
- Access to the range of professional pruning tools
- Access to installation site
- Access to installation tools and supplies
- Access to appropriate site for installations and maintenance of irrigation and drainage
- Range of landscape design periodicals

## **FACULTY CREDENTIAL AND EXPERIENCE REQUIREMENTS LEVEL 1:**

### **All Course Outlines**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma.
- Teaching competence as demonstrated by successful completion of Provincial Instructor Diploma (PIDP) or equivalent or regular faculty status at an institution which has a defined faculty review process (as specified by institutional policy) or contract faculty who have at least completed the Instructional Skills Workshop (PIDP 3102) or equivalent.
- Two years relevant industry experience.

### **Additional Credentials and Experience for Specific Outlines**

#### **A1**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of plant identification experience.

#### **B1**

- Subject matter competence as demonstrated by a Business Diploma with Human Resource or Organizational Behaviour specialty or Baccalaureate Degree in with a minor in Business or Certified Landscape Professional.
- Two years supervisory or management experience in a private or public organization.

#### **C1**

- Subject matter competence as demonstrated by a Outdoor Power Equipment Trades Qualification/Apprentice Certificate.
- 10 years of relevant industry experience.

#### **D1**

- Subject matter competence as demonstrated by a or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Forestry with a minimum of 5 years experience in teaching the subject matter.

#### **E1**

- Subject matter competence as demonstrated by a Horticulture Diploma or Baccalaureate Degree in Horticulture, Agronomy, Forestry, Crop Science, or Pest Management and/or a Diploma in Agriculture or Forestry with a minimum of 5 years experience in teaching the subject matter.

#### **F1**

- Subject matter competence as demonstrated by a Baccalaureate Degree in Soil Science Horticulture, Agronomy, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Pest Management with a minimum of 5 years experience in teaching the subject matter.

#### **H1**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of practical landscape or nursery experience

## **FACULTY CREDENTIAL AND EXPERIENCE REQUIREMENTS LEVEL 2:**

### **All Course Outlines**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma.
- Teaching competence as demonstrated by successful completion of Provincial Instructor Diploma (PIDP) or equivalent or regular faculty status at an institution which has a defined faculty review process (as specified by institutional policy) or contract faculty who have at least completed the Instructional Skills Workshop (PIDP 3102) or equivalent.
- Two years relevant industry experience.

### **Additional Credentials and Experience for Specific Outlines**

#### **A2**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of plant identification experience.

#### **B2**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in with a minor in Business or Certified Landscape Professional.
- Two years supervisory or management experience in a private or public organization.

#### **C2**

- Subject matter competence as demonstrated by a Outdoor Power Equipment Trades Qualification/Apprentice Certificate or equivalent within Horticulture training or education, with a minimum of 2 years of relevant industry experience.

#### **D2**

- Subject matter competence as demonstrated by a or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Forestry with a minimum of 5 years experience in teaching the subject matter.

#### **E2**

- Subject matter competence as demonstrated by a Horticulture Diploma or Baccalaureate Degree in Horticulture, Agronomy, Forestry, Crop Science, or Pest Management and/or a Diploma in Agriculture or Forestry with a minimum of 5 years experience in teaching the subject matter.

#### **F2**

- Subject matter competence as demonstrated by a Baccalaureate Degree in Soil Science Horticulture, Agronomy, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Pest Management with a minimum of 5 years experience in teaching the subject matter.

#### **H2**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of practical landscape or nursery experience

## **FACULTY CREDENTIAL AND EXPERIENCE REQUIREMENTS LEVEL 3:**

### **All Course Outlines**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma.
- Teaching competence as demonstrated by successful completion of Provincial Instructor Diploma (PIDP) or equivalent or regular faculty status at an institution which has a defined faculty review process (as specified by institutional policy) or contract faculty who have at least completed the Instructional Skills Workshop (PIDP 3102) or equivalent.
- Two years relevant industry experience.

### **Additional Credentials and Experience for Specific Outlines**

#### **A3**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science.

#### **E3**

- Subject matter competence as demonstrated by a Horticulture Diploma or Baccalaureate Degree in Horticulture, Agronomy, Forestry, Crop Science, or Pest Management.

#### **F3**

- Subject matter competence as demonstrated by a Baccalaureate Degree in Soil Science Horticulture, Agronomy, Forestry, or Crop Science.

#### **G1**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science.
- Five years relevant industry experience.

#### **I1**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma.

#### **J1**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma, Certified Landscape Professional, or five years industry experience as an estimator.
- Two years relevant industry experience in irrigation and drainage.

#### **L1**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in with a minor in Business or Certified Landscape Professional or Turf Certificate
- Two years supervisory or management experience in a private or public organization.

## **FACULTY CREDENTIAL AND EXPERIENCE REQUIREMENTS LEVEL 4:**

### **All Course Outlines**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma.
- Teaching competence as demonstrated by successful completion of Provincial Instructor Diploma (PIDP) or equivalent or regular faculty status at an institution which has a defined faculty review process (as specified by institutional policy) or contract faculty who have at least completed the Instructional Skills Workshop (PIDP 3102) or equivalent.
- Two years relevant industry experience.

### **Additional Credentials and Experience for Specific Outlines**

#### **A4**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science.

#### **E4**

- Subject matter competence as demonstrated by a Horticulture Diploma or Baccalaureate Degree in Horticulture, Agronomy, Forestry, Crop Science, or Pest Management.

#### **G2**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma combined with International Society of Arboriculture – Arborist Certification.

#### **H3**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma combined with a Certified Horticultural Technician designation (Installation).

#### **I2**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma.
- Two years relevant industry experience.

#### **K1**

- Subject matter competence as demonstrated by a Horticulture Diploma (Landscape Design) or Certified Landscape Designer designation.

#### **L2**

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in with a minor in Business or Certified Landscape Professional.
- Two years supervisory or management experience in a private or public organization.

## REQUIRED TEXTBOOKS AND MANUALS LEVEL 1:

- A-Z Encyclopedia of Garden Plants - Latest edition. Brickel, C. and T. Cole. Dorling Kindersley, Toronto, ON.
- Botany for Gardeners - Latest edition. Capon, Brian. Timber Press, Portland, OR.
- Soil Science and Management - Latest edition. Plaster J. Edward. Thomson/Delmar Learning, Clifton Park, NY.
- British Columbia Landscape Standard - Latest edition. BC Landscape and Nursery Association and the British Columbia Association of Landscape Architects, Surrey, BC
- A1 Demonstrate the Ability to Identify Plants and Describe Their Use, HEBC 2009
- B1 Demonstrate Effective Supervision, HEBC 2009
- C1 Describe Equipment Maintenance and Safety, HEBC 2009
- D1 Describe Plant Science as it Applies to Horticulture, HEBC 2009
- E1 Identify Signs and Symptoms of Living and Non-Living Factors that Cause Plant Stress, HEBC 2009
- F1 Physical and Biological Characteristics of Soil, and Soilless Media, HEBC 2009
- H1 Practical Horticultural Skills ,HEBC 2009

## RECOMMENDED TEXTBOOKS, DOCUMENTS, AND WEBSITES LEVEL 1:

The following list of materials may be helpful to enhance your learning strategies or useful for your reference library dependent on your specialty – **they are not required**

- Kwantlen University College School of Horticulture Plant identification Database, [www.kwantlen.ca/horticulture/](http://www.kwantlen.ca/horticulture/)
- Abiotic Disorders of Landscape Plants : A Diagnostic Guide - Costello, Laurence Raleigh. 2003. University of California, Agriculture and Natural Resources, Oakland, CA.
- Integrated Pest Management Manual for Landscape Pests in British Columbia. Gilkeson, Linda A. 2000. Pollution and Remediation Branch, Victoria, BC. (Also available online at <http://wlapwww.gov.bc.ca/epd/epdpa/ipmp/ipm-manuals.htm>).
- Home and Garden Pest Management Guide for British Columbia - B.C. Ministry of Agriculture Fisheries and Food Latest edition. Crown Publications, Victoria, BC.
- B.C. Nursery and Landscape Pest Management and Production Guide - Latest edition. B.C. Ministry of Environment, Lands, and Parks. Latest Edition, Crown Publications, Victoria BC
- Ball Identification Guide to Greenhouse Pests and Beneficials - Gill, Stanton. 1998. Ball Publication, Batavia, Ill.
- Field Guide to Noxious and Other Selected Weeds of British Columbia - Cranston, Roy. 2002. Ministry of Agriculture, Food and Fisheries; Ministry of Forests, Victoria, BC (Also available online at [<http://www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm>]).
- Pacific Northwest; Plant Disease Management Handbook - 2000. Extension Services of Oregon State University, Washington State University, and the University of Idaho.
- Soil Management Handbook for the Lower Fraser Valley - Bertrand, R.A., G.A. Hughes-Games, and B.C. Nikkel. 1991. Ministry of Agriculture, Fisheries & Food, Abbotsford, B.C.
- Western Fertilizer Handbook - Soil Improvement Committee, California Fertilizer Association. Latest edition.(Horticulture ed.) Interstate Pub Inc., Danville, Illinois.
- Grounds Keepers Safety Guide - Latest edition. Hamilton Canadian Centre for Occupational Health and Safety., ON.
- Equipment Manufacturers Websites (Internet)
- WorkSafeBC Website (WCB Internet)
- Outdoor Power Equipment, Latest Edition, Webster, Jay, Nelson. Canada, Scarborough ON.

### **Personal Apprentice Equipment**

- CSA-approved steel-toed footwear(\*Required)
- Rainwear (\*Recommended)
- Calculator(\*Recommended)
- Workgloves(\*Recommended)
- Hand Lens (10X) (\*Recommended)

## REQUIRED TEXTBOOKS AND MANUALS LEVEL 2:

### Textbooks or other Resources

- A-Z Encyclopedia of Garden Plants - Latest edition. Brickel, C. and T. Cole. Dorling Kindersley, Toronto, ON.
- Botany for Gardeners - Capon, Brian. Latest edition. Timber Press, Portland, OR. .
- Integrated pest management manual for landscape pests in British Columbia - Gilkeson, Linda A. 2000. Pollution and Remediation Branch, Victoria, BC. (Also available online at <http://wlapwww.gov.bc.ca/epd/epdpa/ipmp/ipm-manuals.htm>).
- Soil Science and Management - Latest edition. Plaster J. Edward. Thomson/Delmar Learning, Clifton Park, NY.
- British Columbia Landscape Standard - Latest edition. BC Landscape and Nursery Association, BC Society of Landscape Architects, BC.
- Canadian Standards for Nursery Stock - Latest edition. Canadian Nursery and Landscape Association.
- A2 Demonstrate the Ability to Identify Plants and Describe Their Use ,HEBC 2009
- B2 Demonstrate Effective Supervision ,HEBC 2009
- C2 Describe Equipment Maintenance and Safety, HEBC 2009
- D2 Describe Plant Science as it Applies to Horticulture, HEBC 2009
- E2 Examine Biological Characteristics of Weeds, Plant Feeders and Pathogens and List Control Strategies, HEBC 2009
- F2 Describe Physical and Biological Characteristics of Soil and Soilless Media, HEBC 2009
- H2 Assess Plant Quality and Demonstrate Plant Handling Requirements, HEBC 2009

## RECOMMENDED TEXTBOOKS, DOCUMENTS, AND WEBSITES LEVEL 2:

The following list of materials may be helpful to enhance your learning strategies or useful for your reference library dependent on your specialty – **they are not required**

- Kwantlen University College School of Horticulture Plant identification Database, [www.kwantlen.ca/horticulture/](http://www.kwantlen.ca/horticulture/)
- B.C. Nursery and Landscape Pest Management and Production Guide - Latest edition. B.C. Ministry of Environment, Lands, and Parks. Latest Edition, Crown Publications, Victoria BC
- Home and Garden Pest Management Guide for British Columbia - B.C. Ministry of Agriculture Fisheries and Food Latest edition. Crown Publications, Victoria, BC.
- Field guide to noxious and other selected weeds of British Columbia - Cranston, Roy. 2002. Ministry of Agriculture, Food and Fisheries; Ministry of Forests, Victoria, BC (Also available online at [<http://www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm>]).
- Abiotic disorders of landscape plants: a diagnostic guide - Costello, Laurence Raleigh. 2003. University of California, Agriculture and Natural Resources, Oakland, CA.
- Ball Identification Guide to Greenhouse Pests and Beneficials - Gill, Stanton. 1998. Ball Publication, Batavia, Ill.
- Pacific Northwest; plant disease management handbook - 2008. Extension Services of Oregon State University, Washington State University, and the University of Idaho.
- Handbook for Pesticide Applicators and Pesticide Dispensers - Latest edition. Provincial Ministry of Environment, Province of British Columbia.
- Western Fertilizer Handbook - Soil Improvement Committee, California Fertilizer Association. Latest edition. (Horticulture Ed.) Interstate Pub Inc., Danville, Illinois.
- Soil Fertility Manual - Latest edition. Potash & Phosphate Institute and the Foundation for Agronomic Research. Province of British Columbia Ministry of Skills, Training and Labour and the Centre for

Curriculum and Professional Development, Norcross, GA.

- Considerations for their use - Ministry of Education, Skills and Training and the Ministry of Labour and the Centre for Curriculum and Professional Development. 1995. Province of British Columbia.
- Equipment Manufacturers Websites (Internet)
- WorkSafeBC Website (WCB Internet)
- Outdoor Power Equipment, Latest Edition, Webster, Jay, Nelson. Canada, Scarborough ON.

### **Personal Apprentice Equipment**

- CSA-approved steel-toed footwear(\*Required)
- Rainwear (\*Recommended)
- Calculator(\*Recommended)
- Workgloves(\*Recommended)
- Hand Lens (10X) (\*Recommended)

### **REQUIRED TEXTBOOKS AND MANUALS LEVEL 3:**

- A-Z Encyclopedia of Garden Plants - Latest edition. Brickel, C. and T. Cole. Dorling Kindersley, Toronto, ON.
- B.C. Nursery and Landscape Pest Management and Production Guide - Latest edition. B.C. Ministry of Environment, Lands, and Parks. Latest Edition, Crown Publications, Victoria BC
- Home and Garden Pest Management Guide for British Columbia - B.C. Ministry of Agriculture Fisheries and Food Latest edition. Crown Publications, Victoria, BC.
- Integrated pest management manual for landscape pests in British Columbia - Gilkeson, Linda A. 2000. Pollution and Remediation Branch, Victoria, BC. (Also available online at <http://wlapwww.gov.bc.ca/epd/epdpa/ipmp/ipm-manuals.htm>).
- Arboriculture: Integrated Management of Landscape Trees, Shrubs, and Vines - Harris, R., J. Clark, and N. Matheny. Latest edition. Prentice Hall Upper Saddle River, New Jersey,
- British Columbia Landscape Standard - Latest edition. BCLNA/BCSLA, Surrey B.C.
- Soil Science and Management - Latest edition. Plaster, E. J. Delmar Publishing. Albany, NY
- Irrigation System Design Binder - Hunter Industries. San Marcos, CA.
- A Guide to Troubleshooting Automatic Sprinkler Systems - The Toro Company. Riverside, CA.
- Low-Volume Landscape Irrigation Design Manual - Rain Bird Corporation. Glendora, CA.
- Principles of Exterior Drainage - NDS, Inc. Lindsay, CA.

### **RECOMMENDED TEXTBOOKS, DOCUMENTS, AND WEBSITES LEVEL 3:**

The following list of materials may be helpful to enhance your learning strategies or useful for your reference library dependent on your specialty – **they are not required**

- Kwantlen University College School of Horticulture Plant identification Database, [www.kwantlen.ca/horticulture/](http://www.kwantlen.ca/horticulture/)
- IPM Training Manual for Landscape Gardeners - Daar Sheila, Helga Olkowski and William Oldowski. 1992. The Bio-Integral Resource Centre (BIRC), Berkley, CA.
- IPM for Floriculture and Nurseries - Latest edition. Dreistadt, Steve (editor) University of California, Oakland CA Publication 3402.
- Pests of Landscape Trees and Shrubs - Latest edition. Dreistadt, Steve (editor). University of California Oakland CA. Publication 3359.
- A Colour Handbook of Biological Control in Plant Protection - Latest edition. Helyer, N. et al. Timber Press, Portland OR.
- Knowing and Recognizing - Latest edition. Malais, M.H. and Ravensberg, W.J. Koppert
- Biological Systems - Reed Business Information, Doetinchem, Netherlands.
- Applied Bionomics Biological Technical Manual - Latest edition. Matteoni, J.A. and Elliot, D. Applied Bionomics, Sydney, B.C.
- Concepts in Integrated Pest Management - Latest edition. Norris, R.F., et al. Prentice Hall, Upper Saddle River, NJ.
- Common Sense Pest Control - Latest edition. Olkowski, W. et al. Taunton Press, Newtown, CT.
- Pest Management Recommendations for Greenhouse Crops - Ontario Ministry of Agriculture Latest edition. Publication 365, Ontario MAF.
- Nursery and Landscape Plant Production and IPM Publication 383 - Ontario Ministry of Agriculture. Latest edition. Ontario MAF.
- Entomology and Pest Management - Latest edition. Pedigo, L. P. Prentice Hall, Upper Saddle River, NJ.
- Protecting Nature's Balance: IPM in B.C. - U.B.C. Access. (Video)

- Arborists' Certification Study Guide - Latest edition. International Society of Arboriculture, Champaign III.
- Cavendish Encyclopedia of Pruning and Training - Brickell, C. 1996. Cavendish Books, Vancouver, B.C.
- An Illustrated Guide to Pruning - Latest edition. Gilman, Edward F. Delmar-Thomson Learning, NY.
- Soil Improvement Committee of the California Fertilizer Association. Western Fertilizer Handbook, Horticulture Edition. Latest edition. Interstate Publishers, Danville IL.
- Simplified Irrigation Design - Melby, Pete. 1995. Van Nostrand Reinhold.
- Irrigation System Design – an Engineering Approach - Cuenca, Richard H. 1989. Prentice-Hall, New York.
- Drip Irrigation: For Every Landscape and All Climates - Kourik, Robert. 1992. Metamorphic Press, Santa Rosa, CA.
- Course and Grounds Irrigation and Drainage - Jarrett, Albert R. Golf. 1985. Prentice-Hall, Reston, VA.
- Golf Course Irrigation System Design - Pira, Edward S. 1998. Ann Arbor Press, Ann Arbor, MI.
- Turfgrass Science and Management 3rd edition - Emmons, R. 1999. IPT, Delmar. Albany NY.
- Turf Irrigation Manual - Choate, Richard B. 1994. Weather-Matic Publishing, Dallas, TX.
- Turfgrass Management - Turgeon, A. J. 2002. 6th edition. Prentice-Hall Publishing, Upper Saddle River, NJ.
- Fundamentals of Turfgrass Management - Christians, Nick. 1998. Ann Arbor Press, Chelsea MI.
- The Turf Line News - Western Canada Turfgrass Association, BC.

### **Personal Apprentice Equipment**

- CSA-approved steel-toed footwear(\*Required)
- Rainwear (\*Recommended)
- Calculator(\*Recommended)
- Workgloves(\*Recommended)
- Hand Lens (10X) (\*Recommended)
- Pocket Knife (\*Recommended)
- Felco pruners with scabbard (\*Recommended)

#### **REQUIRED TEXTBOOKS AND MANUALS LEVEL 4:**

- A-Z Encyclopedia of Garden Plants - Latest edition. Brickel, C. and T. Cole. Dorling Kindersley, Toronto, ON.
- Kwantlen University College School of Horticulture Plant identification Database, [www.kwantlen.ca/horticulture/](http://www.kwantlen.ca/horticulture/)
- BC Nursery and Landscape Pest Management and Production Guide - Latest edition. B.C. Ministry of Environment, Lands, and Parks. Latest Edition, Crown Publications, Victoria BC
- Home and Garden Pest Management Guide for British Columbia - B.C. Ministry of Agriculture Fisheries and Food Latest edition. Crown Publications, Victoria, BC.
- Integrated pest management manual for landscape pests in British Columbia - Gilkeson, Linda A. 2000. Pollution and Remediation Branch, Victoria, BC. (Also available online at <http://wlapwww.gov.bc.ca/epd/epdpa/ipmp/ipm-manuals.htm>).
- Arboriculture: Integrated Management of Landscape Trees, Shrubs and Vines. - Latest edition. Harris, Richard W., James R. Clark, Nelda P. Metheny. Prentice Hall, NJ.
- British Columbia Landscape Standard - Latest edition. BC Landscape and Nursery Association and the British Columbia Association of Landscape Architects, Surrey, BC.
- Landscape Construction - Latest edition. Sauter, David. Delmar Thomson Learning, Albany, NY.
- Irrigation System Design Binder - Hunter Industries. San Marcos, CA.
- A Guide to Troubleshooting Automatic Sprinkler Systems - The Toro Company. Riverside, CA.
- Low-Volume Landscape Irrigation Design Manual - Rain Bird Corporation. Glendora, CA.
- Principles of Exterior Drainage - NDS, Inc. Lindsay, CA.
- .

#### **RECOMMENDED TEXTBOOKS, DOCUMENTS, AND WEBSITES LEVEL 4:**

The following list of materials may be helpful to enhance your learning strategies or useful for your reference library dependent on your specialty – **they are not required**

- IPM Training Manual for Landscape Gardeners - Daar Sheila, Helga Olkowski and William Oldowski. 1992. The Bio-Integral Resource Centre (BIRC), Berkley, CA.
- IPM for Floriculture and Nurseries - Latest edition. Dreistadt, Steve (editor) University of California, Oakland CA Publication 3402.
- Pests of Landscape Trees and Shrubs - Latest edition. Dreistadt, Steve (editor). University of California Oakland CA. Publication 3359.
- A Colour Handbook of Biological Control in Plant Protection - Latest edition. Helyer, N. et al. Timber Press, Portland OR.
- Knowing and Recognizing - Latest edition. Malais, M.H. and Ravensberg, W.J. Koppert
- Biological Systems - Reed Business Information, Doetinchem, Netherlands.
- Applied Bionomics Biological Technical Manual - Latest edition. Matteoni, J.A. and Elliot, D. Applied Bionomics, Sydney, B.C.
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- Common Sense Pest Control - Latest edition. Olkowski, W. et al. Taunton Press, Newtown, CT.
- Pest Management Recommendations for Greenhouse Crops - Latest edition. Ontario Ministry of Agriculture Publication 365, Ontario MAF.
- Nursery and Landscape Plant Production and IPM Publication 383 - Latest edition. Ontario Ministry of Agriculture. Ontario MAF.

- Entomology and Pest Management - Latest edition. Pedigo, L. P. Prentice Hall, Upper Saddle River, NJ.
- Protecting Nature's Balance: IPM in B.C. - U.B.C. Access. (Video)
- Simplified Irrigation Design - Melby, Pete. 1995. Van Nostrand Reinhold.
- Irrigation System Design – an Engineering Approach - Cuenca, Richard H. 1989. Prentice-Hall, New York.
- Drip Irrigation: For Every Landscape and All Climates - Kourik, Robert. 1992. Metamorphic Press, Santa Rosa, CA.
- Course and Grounds Irrigation and Drainage - Jarrett, Albert R. Golf. 1985. Prentice-Hall, Reston, VA.
- Golf Course Irrigation System Design - Pira, Edward S. 1998. Ann Arbor Press, Ann Arbor, MI.
- Turf Irrigation Manual - Choate, Richard B. 1994. Weather-Matic Publishing, Dallas, TX.
- Residential Landscape Architecture - 2nd edition. Booth, N. K. & Hiss, J.H. 1999. Prentice-Hall Publishing, Upper Saddle River, NJ.
- Landscape Design A Practical Approach 4th edition - Hannebaum, L.G. 1998. Prentice-Hall Publishing, Upper Saddle River, NJ.
- Turfgrass Management - 6th edition. Turgeon, A. J. 2002. Prentice-Hall Publishing, Upper Saddle River, NJ.
- Fundamentals of Turfgrass Management - Christians, Nick. 1998. Ann Arbor Press, Chelsea MI.
- The Turf Line News - Western Canada Turfgrass Association, BC.

### **Personal Apprentice Equipment**

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- Rainwear (\*Recommended)
- Calculator (\*Recommended)
- Workgloves (\*Recommended)
- Hand Lens (10X) (\*Recommended)
- Pocket Knife (\*Recommended)
- Felco pruners with scabbard (\*Recommended)