



Grades 9 to 12 Horticulture

Manitoba Technical-Vocational
Curriculum Framework
of Outcomes



GRADES 9 TO 12
HORTICULTURE

Manitoba Technical-Vocational Curriculum
Framework of Outcomes

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This resource is available on the Manitoba Education and Advanced
Learning website at <[www.edu.gov.mb.ca/k12/cur/teched/
sy_tech_program.html](http://www.edu.gov.mb.ca/k12/cur/teched/sy_tech_program.html)>.

Available in alternate formats upon request.

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TECHNICAL-VOCATIONAL EDUCATION OVERVIEW

In 2013, Manitoba Education released the document *Technical-Vocational Education Overview* to provide the philosophical and pedagogical underpinnings for curriculum development and the teaching of courses in the Senior Years Technology Education Program. This overview presents educators with the vision and goals of technical-vocational education (TVE) in Manitoba.

Topics include the following:

- curriculum revitalization and renewal
- curriculum framework and implementation
- articulation of programming
- assessment and reporting
- safety
- employability/essential skills and career development
- sustainable development

The TVE curriculum includes Grades 9 to 12 courses in a variety of areas, including horticulture.

HORTICULTURE OVERVIEW

Introduction

Grades 9 to 12 Horticulture: Manitoba Technical-Vocational Curriculum Framework of Outcomes identifies the goals, general learning outcomes (GLOs), and specific learning outcomes (SLOs) for nine horticulture courses. This framework is intended for use in all Manitoba schools teaching horticulture as part of the Senior Years Technology Education Program.

All courses are intended for students pursuing a career in horticulture. They focus on theoretical principles and their practical applications.

Outcomes dealing with the following topics are integrated into most courses:

- sustainability
- ethical and legal standards
- compatibility skills
- working conditions and career opportunities
- evolution, technical progression, and emerging trends

To receive a Senior Years Technical Education diploma, a student must complete eight departmentally developed courses from an approved technical-vocational cluster, together with 16 compulsory credits and six optional credits. The grade level in which the courses are offered are a local,

school-based decision, but it is highly recommended that the sequencing of credits align with the following schedule.

In the TVE curriculum, the emphasis is on landscape maintenance and construction, and greenhouse maintenance and production. Students will have the opportunity to develop a working knowledge of horticulture and to practice the learned skills in greenhouses, on school grounds, and on various worksites in the community. Students will become familiar with interior plantscaping and urban forestry.

- The curriculum is not sequential. In other words, outcomes might be taught in an order that differs from the one in this document.
- In light of rapidly changing trends in horticulture, teachers are encouraged to update their activities in order to meet the needs of students.

Trade Safety Awareness Manual

Apprenticeship Manitoba has developed a Trade Safety Awareness Unit, whose purpose is to increase student awareness of trade safety in the workplace. All students, including those in high school, studying a designated trade must complete this seven-hour unit. The outcomes from the Trade Safety Awareness Unit have been incorporated into Goal 1 of this curriculum. For more information, and to access the Trade Safety Awareness Unit and its tests and other resources, please go to <www.gov.mb.ca/tce/apprent/apprentice/trade_safety/>.

The Trade Safety Awareness Unit's alphanumeric designations are located at the end of the framework outcomes. For example, the following SLO is found in *Grade 10 Introduction to Horticulture*:

Explain how and where to find information on workplace safety and health. (TSA 4)

The (TSA 4) indicates that this outcome is taken from the Trade Safety Awareness Unit from Apprenticeship Manitoba.

Level 1 Apprenticeship for Landscape Horticulturalist from Apprenticeship Manitoba

The Specific Learning Outcomes in the eight mandatory courses include all of the objectives found in Level 1 of the Landscape Horticulturalist curriculum from Apprenticeship Manitoba, thereby meeting the curricular requirements for Level 1 Landscape Horticulturalist.

The Apprenticeship objectives' alphanumeric designations are located at the end of the framework outcomes. For example, the following SLO is found in *Grade 9 Exploration of Horticulture*:

Describe workplace health and safety procedures (e.g., S.A.F.E., right to refuse). (A3.1)

The (A3.1) found at the end indicates that this outcome is taken from the Landscape Horticulturalist curriculum from Apprenticeship Manitoba.

In order to teach the horticulture courses, teachers must refer to the Landscape Horticulturist curriculum documents and reference materials, which can be found at <www.gov.mb.ca/tce/apprent/apprentice/curriculum>.

The Landscape Horticulturist curriculum documents provide necessary, detailed information and clarification of the high school frameworks' outcomes. Teachers must teach all of the objectives and content found in the Landscape Horticulturist curriculum documents and reference materials that are referenced in the frameworks of outcomes. This will ensure that students will have met all of the requirements for Level 1 certification from Apprenticeship Manitoba.

Horticulture programs delivering the eight (8) mandatory courses may be eligible for accreditation with Apprenticeship Manitoba.

Those students obtaining an average of 70% or higher in each of the eight (8) mandatory courses in an accredited Horticulture program may have met the requirements for their Level 1 Landscape Horticulturist.

Please note that facilities also need to be accredited by the Manitoba Apprenticeship Branch for students to obtain their Level 1 accreditation. For more information on getting trade programs accredited by Apprenticeship Manitoba, go to <www.gov.mb.ca/tce/apprent/educator/apprenticeship_school.html>.

Teachers are encouraged to review the apprenticeship guidelines provided by the Apprenticeship Branch of Manitoba Entrepreneurship, Training and Trade at <www.gov.mb.ca/tce/apprent/index.html>.

Greenspace Horticulture Certificate Program from Red River College

The Specific Learning Outcomes in the eight (8) mandatory courses include all of the objectives found in the Greenspace Horticulture Certificate Program curriculum from Red River College, thereby meeting the curricular requirements for that program.

The Greenspace Horticulture Certificate Program DACUM alphanumeric designations are located at the end of the framework outcomes. For example, the following SLO is found in Grade 11A Applied Horticulture.

“Describe the factors that impact plant growth and development. (GHCP A5)”

The (GHCP A5) found at the end indicates that this outcome is taken from the Greenspace Horticulture Certificate Program DACUM from Red River College.

In order to teach the horticulture courses, teachers must refer to the Greenspace Horticulture Certificate Program DACUM. Please contact Red River College for access to these documents.

The Greenspace Horticulture Certificate Program DACUM provides necessary, detailed information and clarification of the high school frameworks' outcomes. Teachers must teach all of the objectives and content found in the Greenspace Horticulture Certificate Program DACUM that are referenced in the frameworks of outcomes.

Horticulture programs delivering the eight (8) mandatory courses may be eligible for articulation with Red River College's program.

Career and Employment Opportunities

Students who complete the program can find entry-level employment with greenhouses, landscaping companies (commercial or residential), florists, parks, botanical gardens, and cemeteries.

Students can also pursue post-secondary education or apprenticeship opportunities in a variety of related areas, or they can become self-employed.

Goals and General Learning Outcomes (GLOs)

The Horticulture curriculum includes 14 goals, which are broken down into General Learning Outcomes, which are further broken down into Specific Learning Outcomes.

Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture.

GLO 1.1: Create and maintain a **safe work** environment in horticulture.

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual** (<www.gov.mb.ca/tce/apprent/apprentice/trade_safety/>).

Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials.** (GHCP B3)

GLO 2.1: Demonstrate the safe and appropriate **maintenance and management of equipment, tools, consumables, and materials.**

GLO 2.2: Demonstrate the safe **operation of horticultural tools and equipment.** (GHCP C1)

Goal 3: Demonstrate an understanding of the **fundamentals of horticulture.**

GLO 3.1: Demonstrate a basic knowledge of **plant anatomy, morphology, and physiology.**

GLO 3.2: **Identify and select plants.**

GLO 3.3: Demonstrate an understanding of **plant care.** (GHCP B2)

Goal 4: Demonstrate an understanding of **soils and growing media.**

GLO 4.1: Demonstrate an understanding of **soils and growing media.**

GLO 4.2: Demonstrate knowledge of the **effects of soils and growing media on plants.** (GHCP A7)

Goal 5: Understand **pest management.**

GLO 5.1: Understand the principles of **integrated pest management.**

Goal 6: Demonstrate an understanding of the principles of **plant installation and propagation.**

GLO 6.1: Demonstrate an understanding of the principles of **plant installation and propagation.**

Goal 7: Demonstrate an understanding of the principles of **crop production and management.**

GLO 7.1: Demonstrate an understanding of **crop production.**

GLO 7.2: Demonstrate an understanding of **crop management.**

Goal 8: Demonstrate an understanding of the **construction techniques** relevant to the horticulture industry.

GLO 8.1: Identify and demonstrate different **construction techniques.**

Goal 9: Demonstrate an understanding of **career opportunities** in horticulture and related environmental fields. (GHCP D1)

GLO 9.1: Describe **education and career opportunities, and professional organizations** in horticulture and related environmental fields.

Goal 10: Describe and demonstrate the transferable, **cross-curricular** knowledge and skills as they pertain to horticulture.

GLO 10.1: **Read, interpret, and communicate** information relevant to horticulture.

GLO 10.2: Apply **mathematics** knowledge and skills relevant to horticulture.

GLO 10.3: Apply **other subject areas** (art, physical education/health education) knowledge and skills relevant to horticulture.

Goal 11: Demonstrate awareness of **sustainability** as it pertains to horticulture.

GLO 11.1: Describe the impact of **sustainability** on the health and well-being of horticulture workers and their clients, as well as the role of horticulture in society.

GLO 11.2: Describe the horticulture industry's **sustainability practices and environmental impacts.**

GLO 11.3: Describe **sustainable business practices** within the horticulture industry.

Goal 12: Demonstrate awareness of the **ethical and legal standards** as they pertain to horticulture.

GLO 12.1: Apply the **ethical and legal standards** as they pertain to horticulture.

Goal 13: Demonstrate **employability skills** related to horticulture. (GHCP D1) (GHCP D4)

GLO 13.1: Demonstrate **fundamental employability skills.**

Goal 14: Demonstrate an understanding of the **evolution and technological progression of, and the emerging trends in** horticulture.

GLO 14.1: Demonstrate an understanding of the **evolution and technological progression of, and the emerging trends in** horticulture.

Specific Learning Outcomes (SLOs)

Grades 9 to 12 Horticulture: Manitoba Technical-Vocational Curriculum Framework of Outcomes identifies specific learning outcomes (SLOs) for use in all Manitoba schools teaching the Grades 9 to 12 horticulture courses as part of the Senior Years Technology Education Program. Specific learning outcome statements define what students are expected to achieve by the end of the course.

It is essential for students to learn and to demonstrate safety practices and employability skills; therefore, some SLOs related to safety and to employability skills are repeated in all the courses.

8764 Advanced Horticulture 40S/40E/40M

This course is intended for students entering the transition phase of the horticulture program. The curriculum focuses on an integration of learned concepts related to plant propagation, maintenance, growing media, and cultural requirements to maximize plant growth and yields. Students are actively involved in plant care and maintenance.

8765 Applied Landscape Maintenance and Construction 40S/40E/40M

This course is intended for students in the transition phase of the horticulture program. The curriculum focuses on increasing students' knowledge and skills in landscape maintenance and construction. Students participate in the design, construction, and maintenance of landscape structures and sites.

8766 Applied Greenhouse Maintenance and Production 40S/40E/40M

This course is intended for students in the transition phase of the horticulture program. The curriculum focuses on increasing students' knowledge and skills in greenhouse maintenance and production. Students participate in the planning and implementation of a greenhouse crop with a focus on productivity.

8767 Arboriculture 40S/40E/40M

This course is intended for students transitioning from the horticulture program. The curriculum focuses on the care and maintenance of woody plants in the landscape. Topics include pruning, establishment, cultural requirements, disease, and pest management, as well as the benefits of trees to the environment.

Curriculum Implementation Dates

During **voluntary implementation**, teachers have the option of teaching the entire new draft curriculum as soon as Manitoba Education and Advanced Learning releases it on the [Technology Education](#) website. They also have the option of teaching the courses from the previous curriculum. Teachers who implement courses before system-wide implementation need to ensure that students who are already taking courses from the previous curriculum achieve all SLOs with a minimum of redundancy.

Voluntary implementation of all horticulture courses began in the fall of 2013 and will continue until their respective system-wide implementation dates.

Date	System-Wide Implementation
Fall 2014	Grade 9 (optional)
Fall 2015	Grade 10
Fall 2016	Grade 11
Fall 2017	Grade 12

Under **system-wide implementation**, all teachers in Manitoba teach the new curriculum and use the new course codes. Teachers will no longer be able to use the previous course codes. Course codes are found in the [Subject Table Handbook: Technology Education](#).



GRADES 9 TO 11
HORTICULTURE

General and Specific Learning
Outcomes by Goal

GRADES 9 TO 11 HORTICULTURE: GENERAL AND SPECIFIC LEARNING OUTCOMES BY GOAL

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture.

GLO 1.1: Create and maintain a **safe work** environment in horticulture.

9.1.1.1 Describe workplace safety and health procedures (e.g., S.A.F.E., right to refuse). (A3.1)	10.1.1.1 →	11A.1.1.1 →	11B.1.1.1 →	11C.1.1.1 →
9.1.1.2 Identify and report hazards (e.g., electrical safety, ergonomics, material handling, chemicals) related to processes, materials, tools, and equipment used in horticulture and landscaping. (A3.7) (D1.2)	10.1.1.2 →	11A.1.1.2 →	11B.1.1.2 →	11C.1.1.2 →
9.1.1.3 Outline the safety principles for working on and around electrical equipment. (A3.8) (TSA 18)	10.1.1.3 →	11A.1.1.3 →	11B.1.1.3 →	11C.1.1.3 →

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.1: Create and maintain a **safe work** environment in horticulture. *(continued)*

9.1.1.4 Follow the directions of the teacher/supervisor in regard to safe work practices.	10.1.1.4 →	11A.1.1.4 →	11B.1.1.4 →	11C.1.1.4 →
9.1.1.5 Follow safe practices and procedures for facilities, processes, materials, tools, and equipment used in horticulture and landscaping (e.g., keep work area clean and organized). (A3.3)	10.1.1.5 →	11A.1.1.5 →	11B.1.1.5 →	11C.1.1.5 →
9.1.1.6 Describe and use appropriate personal protective equipment (PPE) (e.g., gloves, safety glasses or goggles, hearing protection, respirator mask) and identify PPE and procedures related to PPE. (A3.2) (TSA 16)	10.1.1.6 →	11A.1.1.6 →	11B.1.1.6 →	11C.1.1.6 →

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.1: Create and maintain a **safe work** environment in horticulture. *(continued)*

9.1.1.7 Locate the first aid and eyewash stations.	10.1.1.7 →	11A.1.1.7 →	11B.1.1.7 →	11C.1.1.7 →
9.1.1.8 Identify the process for reporting injuries.	10.1.1.8 →	11A.1.1.8 →	11B.1.1.8 →	11C.1.1.8 →
9.1.1.9 Identify ergonomically correct procedures to avoid injury (e.g., stress, strain, lifting).	10.1.1.9 →	11A.1.1.9 →	11B.1.1.9 →	11C.1.1.9 →
9.1.1.10 Identify and outline workplace fire safety principles. (A3.10) (TSA 19)	10.1.1.10 →	11A.1.1.10 →	11B.1.1.10 →	11C.1.1.10 →
9.1.1.11 Identify emergency evacuation and response procedures.	10.1.1.11 →	11A.1.1.11 →	11B.1.1.11 →	11C.1.1.11 →
9.1.1.12 Identify potential hazards with regard to personal apparel and grooming.	10.1.1.12 →	11A.1.1.12 →	11B.1.1.12 →	11C.1.1.12 →

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.1: Create and maintain a **safe work** environment in horticulture. *(continued)*

9.1.1.13 Demonstrate awareness of the principles of the Workplace Hazardous Materials Information Systems (WHMIS) as they apply to the horticulture industry and identify safety requirements as they apply to WHMIS. (A3.11) (TSA 13)	10.1.1.13 →	11A.1.1.13 →	11B.1.1.13 →	11C.1.1.13 →
9.1.1.14 Describe the purpose of Material Safety Data Sheets (MSDS).	10.1.1.14 →	11A.1.1.14 →	11B.1.1.14 →	11C.1.1.14 →
9.1.1.15 Demonstrate knowledge of the need and purpose of safe handling and application of chemical controls according to the label. (A3.4, A3.14)	10.1.1.15 →	11A.1.1.15 →	11B.1.1.15 →	11C.1.1.15 →

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.1: Create and maintain a **safe work** environment in horticulture. *(continued)*

9.1.1.16 Identify the hazards associated with working in a confined space and the preparation required to work safely in a confined space. (A3.9) (TSA 20)	10.1.1.16 →	11A.1.1.16 →	11B.1.1.16 →	11C.1.1.16 →
9.1.1.17 Identify the hazards and precautions related to working with and around horticulture and landscaping equipment, including ladders and scaffolding. (A3.5, A3.6)	10.1.1.17 →	11A.1.1.17 →	11B.1.1.17 →	11C.1.1.17 →
9.1.1.18 Identify the need for a safety checklist in the landscaping and horticulture industries (e.g., chainsaw, power lawnmower, garden tractor).	10.1.1.18 →	11A.1.1.18 →	11B.1.1.18 →	11C.1.1.18 →

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual** (www.gov.mb.ca/tce/apprent/apprentice/trade_safety/).

10.1.2.1 Explain the importance of trade safety and health in reducing injuries and fatalities to young employees in Manitoba. (TSA 1)

10.1.2.2 Describe the rights and responsibilities of employees, employers, and supervisors under the Workplace Safety and Health Act. (TSA 2)

10.1.2.3 Describe the steps to use in the Right to Refuse process. (TSA 3)

10.1.2.4 Explain how and where to find information on workplace safety and health. (TSA 4)

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual** (<www.gov.mb.ca/tce/apprent/apprentice/trade_safety/>). *(continued)*

10.1.2.5 Demonstrate how to handle a potentially dangerous work situation. (TSA 5)

10.1.2.6 Explain the S.A.F.E. acronym. (TSA 6)

10.1.2.7 Define workplace safety and health hazards. (TSA 7)

10.1.2.8 Give examples of trade-specific workplace safety and health hazards. (TSA 8)

10.1.2.9 Give examples of five types of safety and health hazards. (TSA 9)

10.1.2.10 Define workplace safety and health risks. (TSA 10)

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. (*continued*)

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual** (www.gov.mb.ca/tce/apprent/apprentice/trade_safety/). (*continued*)

10.1.2.11 Give examples of trade-specific workplace safety and health risks. (TSA 11)

10.1.2.12 Explain the principles of hazard recognition and control as they apply to the specific trade. (TSA 12)

10.1.2.13 Match the WHMIS hazardous materials symbols and their meanings. (TSA 14)

10.1.2.14 Describe the importance of the Material Safety Data Sheets (MSDS). (TSA 15)

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. (*continued*)

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual** (<www.gov.mb.ca/tce/apprent/apprentice/trade_safety/>). (*continued*)

10.1.2.15 Demonstrate proper selection and use of a variety of personal protective equipment and fall protection systems. (TSA 17)

Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials**. (A5) (GHCP B3)

GLO 2.1: Demonstrate the safe and appropriate **maintenance and management of equipment, tools, consumables, and materials**.

9.2.1.1 Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials.

10.2.1.1 →

11A.2.1.1 →

11B.2.1.1 Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials used in landscape maintenance and construction.

11C.2.1.1 Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials used in greenhouse maintenance and production.

11B.2.1.2 Troubleshoot minor problems with equipment.

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Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials.** (A5) (GHCP B3) *(continued)*

GLO 2.1: Demonstrate the safe and appropriate **maintenance and management of equipment, tools, consumables, and materials.** *(continued)*

11B.2.1.3 Describe the procedures used to inspect, maintain, sharpen, clean, and store hand and power tools. (A4.4, A4.6)

11B.2.1.4 Describe the procedures used to inspect, clean, maintain, and store measuring tools and equipment. (A4.8)

11B.2.1.5 Use and maintain hand, power, and measuring tools applicable to the workplace. (A4.9)

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Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials.** (A5) (GHCP B3) *(continued)*

GLO 2.2: Demonstrate the safe **operation of horticultural tools and equipment.** (GHCP C1)

9.2.2.1 Demonstrate the safe operation of horticultural tools and equipment.	10.2.2.1 →	11A.2.2.1 →	11B.2.2.1 Demonstrate the safe operation of horticultural tools and equipment used in landscape maintenance and construction.	11C.2.2.1 Demonstrate the safe operation of horticultural tools and equipment used in greenhouse maintenance and production.
9.2.2.2 Demonstrate knowledge of the correct measuring and hand tools, and power equipment for a task.	10.2.2.2 Identify and use the correct measuring and hand tools, and power equipment for a task.	11A.2.2.2 Select and use correct measuring and hand tools, and power equipment for a task. (A4.3, A4.5, A4.7)	11B.2.2.2 Identify types of engines and describe their characteristics, applications, and operations. (A5.7)	
			11B.2.2.3 Demonstrate the ability to perform the necessary checks prior to use.	

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Goal 3: Demonstrate an understanding of the **fundamentals of horticulture.**

GLO 3.1: Demonstrate a basic knowledge of **plant anatomy, morphology, and physiology.**

9.3.1.1 Identify plant categories.	10.3.1.1 →	11A.3.1.1 Describe the characteristics of plant categories. (A6.3)
9.3.1.2 Identify plant anatomy and morphology. (B2.3)	10.3.1.2 →	11A.3.1.2 Describe plant anatomy and morphology.
9.3.1.3 Identify the factors that impact plant growth and development. (B2.2)	10.3.1.3 →	11A.3.1.3 Describe the factors that impact plant growth and development. (GHCP A5)
9.3.1.4 Identify the functions of a plant as an organism. (B2.4)	10.3.1.4 →	11A.3.1.4 Explain the functions of a plant as an organism. (B2.4) (GHCP A6)
9.3.1.5 Define plant science terminology. (B2.1)	10.3.1.5 →	11A.3.1.5 Demonstrate and utilize plant science terminology.
9.3.1.6 Define terminology associated with fertilizers.(D1.1)	10.3.1.6 →	11A.3.1.6 Demonstrate and utilize terminology associated with fertilizers.

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Goal 3: Demonstrate an understanding of the **fundamentals of horticulture.** *(continued)*

GLO 3.1: Demonstrate a basic knowledge of **plant anatomy, morphology, and physiology.** *(continued)*

11A.3.1.7 Identify plant nutrients and describe the impact of nutrient deficiencies/excesses on plants and plant growth. (B2.5)

GLO 3.2: Identify and select plants.

9.3.2.1 Identify a dichotomous key used to classify plants.	10.3.2.1 Define a dichotomous key used to classify plants.	11A.3.2.1 Demonstrate the ability to use a dichotomous key. (A6.2)
9.3.2.2 Identify morphological characteristics of plant families.	10.3.2.2 Define morphological characteristics of plant families.	11A.3.2.2 Demonstrate the ability to use morphological characteristics to identify plant families. (A6.4)
9.3.2.3 Identify morphological characteristics of plant genus and species.	10.3.2.3 Define morphological characteristics of plant genus and species.	11A.3.2.3 Demonstrate the ability to use morphological characteristics to identify plants by genus and species. (A6.5) (GHCP A2)

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Goal 3: Demonstrate an understanding of the **fundamentals of horticulture.** *(continued)*

GLO 3.2: Identify and select plants. *(continued)*

9.3.2.4 Identify plants by common and botanical names, and family names. (GHCP A3)	10.3.2.4 →	11A.3.2.4 →
9.3.2.5 Demonstrate knowledge of the International system of Plant Nomenclature (taxonomy).	10.3.2.5 Define the International System of Plant Nomenclature (taxonomy). (A6.1)	11A.3.2.5 Demonstrate proper usage of the International System of Plant Nomenclature (taxonomy). (GHCP A1)

GLO 3.3: Demonstrate an understanding of plant care.

9.3.3.1 Demonstrate knowledge of cultural requirements of plants.	10.3.3.1 Identify cultural requirements of plants.	11A.3.3.1 Describe and demonstrate the cultural requirements of the plants on the Landscape Horticulturist Plant List by Family as found in Landscape Horticulturist Level 1 from Apprenticeship Manitoba. (A6.6)
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Goal 4: Demonstrate an understanding of **soils and growing media.**

GLO 4.1: Demonstrate an understanding of **soils and growing media.**

<p>9.4.1.1 Demonstrate knowledge of the physical characteristics that must be considered when determining the suitability for plant growth.</p>	<p>10.4.1.1 Identify the physical characteristics that must be considered when determining the suitability for plant growth.</p>	<p>11A.4.1.1 Describe the physical characteristics that must be considered when determining the suitability for plant growth. (A9.1) (GHCP A7)</p>
<p>9.4.1.2 Demonstrate knowledge of the types of media, as well as their characteristics and applications.</p>	<p>10.4.1.2 Identify types of media, as well as their characteristics and applications.</p>	<p>11A.4.1.2 Describe types of media, as well as their characteristics and applications. (A9.3)</p>
<p>9.4.1.3 Demonstrate knowledge of soil science terminology.</p>	<p>10.4.1.3 Define soil science terminology.</p>	<p>11A.4.1.3 Describe and utilize soil science terminology.</p>
<p>9.4.1.4 Demonstrate knowledge of the chemical and biological properties of soils and growing media.</p>	<p>10.4.1.4 Identify the chemical and biological properties of soils and growing media.</p>	<p>11A.4.1.4 Describe the chemical and biological properties of soils and growing media. (A9.4) (GHCP A7)</p>

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Goal 4: Demonstrate an understanding of **soils and growing media**. *(continued)*

GLO 4.2: Demonstrate knowledge of the **effects of soils and growing media on plants**. (GHCP A7)

10.4.2.1 Demonstrate knowledge of the purpose of soil samples.	11A.4.2.1 Identify the purpose of soil samples.	11B.4.2.1 Discuss the purpose and characteristics of soil amendments.	11C.4.2.1 Describe the effects of growing media on plants.
10.4.2.2 Demonstrate knowledge of the effects of water and nutrient uptake by roots.	11A.4.2.2 Identify the effects of water and nutrient uptake by roots.	11B.4.2.2 Analyze the effects of water and nutrient uptake by roots in an outdoor environment.	11C.4.2.2 Analyze the effects of water and nutrient uptake by roots in a greenhouse.
10.4.2.3 Demonstrate knowledge of atmospheric conditions that influence water availability.	11A.4.2.3 Identify atmospheric conditions that influence water availability.	11B.4.2.3 Analyze atmospheric conditions that influence water availability in an outdoor environment, and respond accordingly.	11C.4.2.3 Analyze atmospheric conditions that influence water availability in a greenhouse, and respond accordingly.
10.4.2.4 Demonstrate knowledge of types of soil amendments, as well as their characteristics and applications.	11A.4.2.4 Identify types of soil amendments, as well as their characteristics and applications.		

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Goal 4: Demonstrate an understanding of **soils and growing media.** *(continued)*

GLO 4.2: Demonstrate knowledge of the **effects of soils and growing media on plants.** (GHCP A7) *(continued)*

10.4.2.5 Recognize the considerations when selecting soil amendments for plants.	11A.4.2.5 Identify the considerations when selecting soil amendments for plants.
10.4.2.6 Recognize the procedures to select and incorporate soil amendments for plants.	11A.4.2.6 Identify the procedures to select and incorporate soil amendments for plants.

Goal 5: Understand **pest management.**

GLO 5.1: Understand the **principles of integrated pest management.**

9.5.1.1 Demonstrate knowledge of common pests.	10.5.1.1 Identify common pests.	11A.5.1.1 →	11B.5.1.1 Identify common pests in an outdoor environment.	11C.5.1.1 Identify common pests in a greenhouse.
9.5.1.2 Demonstrate knowledge of damage caused by pests.	10.5.1.2 Identify damage caused by pests.	11A.5.1.2 →	11B.5.1.2 Identify damage caused by pests in an outdoor environment.	11C.5.1.2 Identify damage caused by pests in a greenhouse.

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Goal 5: Understand pest management. *(continued)*

GLO 5.1: Understand the principles of integrated pest management. *(continued)*

9.5.1.3 Demonstrate knowledge of pest control techniques.	10.5.1.3 Identify pest control techniques.	11A.5.1.3 Describe pest control techniques.	11B.5.1.3 Practise integrated pest management in an outdoor environment.	11C.5.1.3 Practise integrated pest management in a greenhouse.
9.5.1.4 Demonstrate knowledge of the difference between Integrated Pest Management (IPM) and conventional pest management.	10.5.1.4 Identify the difference between IPM and conventional pest management.	11A.5.1.4 Describe the difference between IPM and conventional pest management.	11B.5.1.4 Differentiate between abiotic and biotic damage to plants in an outdoor environment.	11C.5.1.4 Differentiate between abiotic and biotic damage to plants in a greenhouse.
9.5.1.5 Demonstrate knowledge of pest biology in terms of IPM.	10.5.1.5 Identify pest biology in terms of IPM.	11A.5.1.5 Describe pest biology in terms of IPM.		
9.5.1.6 Demonstrate knowledge of the ecological concepts related to IPM.	10.5.1.6 Identify the ecological concepts related to IPM.	11A.5.1.6 Describe the ecological concepts related to IPM.		
9.5.1.7 Demonstrate knowledge of the significance of pests.	10.5.1.7 Identify the significance of pests.	11A.5.1.7 Describe the significance of pests.		

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Goal 6: Demonstrate an understanding of the principles of **plant installation and propagation.**

GLO 6.1: Demonstrate an understanding of the principles of **plant installation and propagation.**

9.6.1.1 Install plant material. (GHCP B1)	10.6.1.1 →	11A.6.1.1 →	11B.6.1.1 →	11C.6.1.1 →
9.6.1.2 Demonstrate knowledge of different methods of plant propagation.	10.6.1.2 Identify different methods of plant propagation.	11A.6.1.2 Describe different methods of plant propagation.	11B.6.1.2 Apply different methods of plant propagation appropriate to an outdoor environment.	11C.6.1.2 Apply different methods of plant propagation appropriate to a greenhouse.
9.6.1.3 Demonstrate knowledge of the difference between asexual and sexual propagation.	10.6.1.3 Identify the difference between asexual and sexual propagation.	11A.6.1.3 Describe the difference between asexual and sexual propagation.		

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Goal 7: Demonstrate an understanding of the principles of **crop production and management.**

GLO 7.1: Demonstrate an understanding of **crop production.**

9.7.1.1 Demonstrate knowledge of pre-harvest and post-harvest factors that affect quality.	10.7.1.1 Identify pre-harvest and post-harvest factors that affect quality.	11A.7.1.1 Describe pre-harvest and post-harvest factors that affect quality.		11C.7.1.1 Apply pre-harvest and post-harvest practices to maximize quality.
9.7.1.2 Demonstrate knowledge of the factors involved in planning a greenhouse crop.	10.7.1.2 Identify the factors involved in planning a greenhouse crop.	11A.7.1.2 Describe the factors involved in planning a greenhouse crop.		11C.7.1.2 Plan a greenhouse crop.
9.7.1.3 Demonstrate knowledge of crops suitable for greenhouse production.	10.7.1.3 Identify crops suitable for greenhouse production.	11A.7.1.3 Describe crops suitable for greenhouse production.		11C.7.1.3 Produce greenhouse crops.

GLO 7.2: Demonstrate an understanding of **crop management.**

9.7.2.1 Demonstrate knowledge of practices to improve crop quality.	10.7.2.1 Identify practices to improve crop quality.	11A.7.2.1 Describe practices to improve crop quality.		11C.7.2.1 Apply practices to improve crop quality.
9.7.2.2 Demonstrate knowledge of cultural requirements that affect crop production.	10.7.2.2 Identify cultural requirements that affect crop production.	11A.7.2.2 Describe cultural requirements that affect crop production.		11C.7.2.2 Apply cultural practices to maximize crop production.

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Goal 8: Demonstrate an understanding of the **construction techniques** relevant to the horticulture industry.

GLO 8.1: Identify and demonstrate different **construction techniques**.

9.8.1.1 Demonstrate knowledge of the design components of a landscape plan.	10.8.1.1 Identify the design components of a landscape plan.		11B.8.1.1 Describe types of landscape plans and documentation. (C1.1)	
	10.8.1.2 Identify information in specifications.		11B.8.1.2 Interpret the information and design principles on landscape plans. (C1.2)	
	10.8.1.3 Identify types of landscape plans and documentation.		11B.8.1.3 Interpret information in specifications. (C1.3)	

Goal 9: Demonstrate an understanding of **career opportunities** in horticulture and related environmental fields. (GHCP D1)

GLO 9.1: Describe **education and career opportunities, and professional organizations** in horticulture and related environmental fields.

9.9.1.1 Describe the structure and scope of horticulture and related environmental fields. (A1.1)	10.9.1.1 →	11A.9.1.1 Describe the Manitoba Landscape Horticulturist Technician Apprenticeship Program. (A1.2)	11B.9.1.1 Describe special opportunities and challenges regarding Landscape Horticulturist Training. (A1.3)	11C.9.1.1 Identify the relationship between journey person and apprenticeship. (A10.2)
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Goal 10: Describe and demonstrate the transferable, **cross-curricular** knowledge and skills as they pertain to horticulture.

GLO 10.1: Read, interpret, and communicate information relevant to horticulture.

9.10.1.1 Identify effective communication practices. (A10.1) (GHCP D4)	10.10.1.1 →	11A.10.1.1 Communicate effectively using verbal and non-verbal techniques. (A10.5) (GHCP D4)	11B.10.1.1 Use terminology relevant to horticulture.	11C.10.1.1 Use effective personal communication. (A10.4) (GHCP D4)
	10.10.1.2 Read written information in different types of workplace documents (e.g., work instructions, emails and memos, health and safety manuals, policies, and reports). (A10.3)	11A.10.1.2 Read and understand written information in different types of workplace documents (e.g., work instructions, emails and memos, health and safety manuals, policies, and reports). (A10.3)	11B.10.1.2 Read, understand, and produce written information in different types of workplace documents (e.g., work instructions, emails and memos, health and safety manuals, policies, and reports). (A10.3)	11C.10.1.2 →

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Goal 10: Describe and demonstrate the transferable, **cross-curricular** knowledge and skills as they pertain to horticulture. (*continued*)

GLO 10.2: Apply **mathematics** knowledge and skills relevant to horticulture.

9.10.2.1 Use the basic mathematical processes of addition, subtraction, multiplication, and division. (B1.1)	10.10.2.1 →	11A.10.2.1 Solve problems using ratios and proportions. (B1.3)	11B.10.2.1 Express values of quantity measurement in both imperial and metric units. (B1.5)
9.10.2.2 Calculate measurements. (B1.2)	10.10.2.2 →	11A.10.2.2 Solve problems using basic algebra. (B1.4)	

GLO 10.3: Apply **other subject areas** (art, physical education/health education) knowledge and skills relevant to horticulture.

10.10.3.1 Discuss the fitness requirements for working in horticulture and related fields.
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Goal 11: Demonstrate awareness of **sustainability** as it pertains to horticulture.

GLO 11.1: Describe the impact of **sustainability** on the health and well-being of horticulture workers and their clients, as well as the role of horticulture in society.

10.11.1.1 Demonstrate knowledge of the concept of sustainability.

11A.11.1.1 Identify the dynamic interrelationship between human health and well-being, and horticulture.

11B.11.1.1 Describe the dynamic interrelationship between human health and well-being, and horticulture.

GLO 11.2: Describe the horticulture industry's **sustainability practices and environmental impacts**.

9.11.2.1 Demonstrate knowledge of the environmental impact of various horticultural practices. (D1.3) (A5.2)

10.11.2.1 Identify the environmental impact of various horticultural practices.

11A.11.2.1 Describe the environmental impact of various horticultural practices.

11B.11.2.1 Describe the dynamic interrelationship between the environment and the economy.

11A.11.2.2 Describe the implications of hand and power tool selection and use on the practice of environmental stewardship. (A4.2)

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Goal 11: Demonstrate awareness of **sustainability** as it pertains to horticulture. *(continued)*

GLO 11.3: Describe **sustainable business practices** within the horticulture industry.

9.11.3.1 Demonstrate knowledge of the needs of the present world without compromising the ability of future generations to meet their own needs.	10.11.3.1 Identify the needs of the present world without compromising the ability of future generations to meet their own needs.	11A.11.3.1 Describe how the needs of the present world can be met without compromising the ability of future generations to meet their own needs.	11B.11.3.1 Discuss practices which promote long-term business success.	11C.11.3.1 Identify the dynamic interrelationship between the environment and the economy.
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Goal 12: Demonstrate awareness of the **ethical and legal standards** as they pertain to horticulture.

GLO 12.1: Apply the **ethical and legal standards** as they pertain to horticulture.

9.12.1.1 Demonstrate knowledge of the ethical and legal expectations related to the horticulture industry.	10.12.1.1 Identify the ethical and legal expectations related to the horticulture industry.	11A.12.1.1 Describe the ethical and legal expectations related to the horticulture industry.	11B.12.1.1 Describe the ethical and legal expectations related to the landscaping industry.	11C.12.1.1 Describe the ethical and legal expectations related to the greenhouse industry.
	10.12.1.2 Demonstrate knowledge of the need for government legislation pertaining to the horticulture industry.	11A.12.1.2 Describe pertinent legislation pertaining to the horticulture industry. (A3.14, A3.4)		

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 13: Demonstrate **employability skills** related to horticulture. (GHCP D1) (GHCP D4)

GLO 13.1: Demonstrate **fundamental employability skills**.

9.13.1.1 Arrive on time and be prepared for work.	10.13.1.1 →	11A.13.1.1 →	11B.13.1.1 →	11C.13.1.1 →
9.13.1.2 Meet deadlines.	10.13.1.2 →	11A.13.1.2 →	11B.13.1.2 →	11C.13.1.2 →
9.13.1.3 Use time effectively.	10.13.1.3 →	11A.13.1.3 →	11B.13.1.3 →	11C.13.1.3 →
9.13.1.4 Follow written and oral directions.	10.13.1.4 →	11A.13.1.4 →	11B.13.1.4 →	11C.13.1.4 →
9.13.1.5 Ask questions for clarification.	10.13.1.5 →	11A.13.1.5 →	11B.13.1.5 →	11C.13.1.5 →
9.13.1.6 Initiate work independently.	10.13.1.6 →	11A.13.1.6 →	11B.13.1.6 →	11C.13.1.6 →
9.13.1.7 Work effectively without supervision.	10.13.1.7 →	11A.13.1.7 →	11B.13.1.7 →	11C.13.1.7 →
9.13.1.8 Complete tasks without supervision.	10.13.1.8 →	11A.13.1.8 →	11B.13.1.8 →	11C.13.1.8 →
9.13.1.9 Fulfill commitments to self and others.	10.13.1.9 →	11A.13.1.9 →	11B.13.1.9 →	11C.13.1.9 →

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 13: Demonstrate **employability skills** related to horticulture. (GHCP D1) (GHCP D4) *(continued)*

GLO 13.1: Demonstrate **fundamental employability skills.** *(continued)*

9.13.1.10 Perform tasks to a high standard.	10.13.1.10 →	11A.13.1.10 →	11B.13.1.10 →	11C.13.1.10 →
9.13.10.11 Cooperate with others.	10.13.1.11 →	11A.13.1.11 →	11B.13.1.11 →	11C.13.1.11 →
9.13.10.12 Act respectfully towards oneself and others.	10.13.1.12 →	11A.13.1.12 →	11B.13.1.12 →	11C.13.1.12 →
9.13.10.13 Participate in group activities.	10.13.1.13 →	11A.13.1.13 →	11B.13.1.13 →	11C.13.1.13 →
9.13.10.14 Dress appropriately for the workplace.	10.13.1.14 →	11A.13.1.14 →	11B.13.1.14 →	11C.13.1.14 →
9.13.10.15 Demonstrate appropriate site etiquette. (GHCP D3)	10.13.1.15 →	11A.13.1.15 →	11B.13.1.15 →	11C.13.1.15 →
9.13.10.16 Maintain a clean and organized work area. (A3.3)	10.13.1.16 →	11A.13.1.16 →	11B.13.1.16 →	11C.13.1.16 →

8717 Exploration of Horticulture (9) 15S / 15E / 15M 10S / 10E / 10M	8718 Introduction to Horticulture (10) 20S / 20E / 20M	8719 Applied Horticulture (11A) 30S / 30E / 30M	8733 Introduction to Landscape Maintenance and Construction (11B) 30S / 30E / 30M	8734 Introduction to Greenhouse Maintenance and Production (11C) 30S / 30E / 30M
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Goal 14: Demonstrate an understanding of the **evolution and technological progression of, and the emerging trends in** horticulture.

GLO 14.1: Demonstrate an understanding of the **evolution and technological progression of, and the emerging trends in** horticulture.

9.14.1.1 Describe the evolution and technological progression of, and the emerging trends in the horticulture industry.	10.14.1.1 →	11A.14.1.1 →	11B.14.1.1 Describe the evolution and technological progression of, and the emerging trends in the landscaping industry.	11C.14.1.1 Describe the evolution and technological progression of, and the emerging trends in the greenhouse industry.
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GRADE 12 HORTICULTURE

General and Specific Learning
Outcomes by Goal

GRADE 12 HORTICULTURE: GENERAL AND SPECIFIC LEARNING OUTCOMES BY GOAL

8764 Advanced Horticulture (12A) 40S / 40E / 40M	8765 Applied Landscape Maintenance and Construction (12B) 40S / 40E / 40M	8766 Applied Greenhouse Maintenance and Production (12C) 40S / 40E / 40M	8767 Arboriculture (12D) 40S / 40E / 40M
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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture.

GLO 1.1: Create and maintain a **safe work** environment in horticulture.

12A.1.1.1 Describe workplace safety and health procedures (e.g., S.A.F.E., right to refuse). (A3.1)	12B.1.1.1 →	12C.1.1.1 →	12D.1.1.1 →
12A.1.1.2 Identify and report hazards (e.g., electrical safety, ergonomics, material handling, chemical) related to processes, materials, tools, and equipment used in horticulture and landscaping areas. (A3.7) (D1.2)	12B.1.1.2 →	12C.1.1.2 →	12D.1.1.2 →
12A.1.1.3 Outline the safety principles for working on and around electrical equipment. (A3.8) (TSA 18)	12B.1.1.3 →	12C.1.1.3 →	12D.1.1.3 →
12A.1.1.4 Follow the directions of the teacher/supervisor in regard to safe work practices.	12B.1.1.4 →	12C.1.1.4 →	12D.1.1.4 →

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.1: Create and maintain a **safe work** environment in horticulture. *(continued)*

12A.1.1.5 Follow safe practices and procedures for facilities, processes, materials, tools, and equipment used in horticulture and landscaping areas (e.g., keep work area clean and organized). (A3.3)	12B.1.1.5 →	12C.1.1.5 →	12D.1.1.5 →
12A.1.1.6 Describe and use appropriate personal protective equipment (PPE) (e.g., gloves, safety glasses or goggles, hearing protection, respirator mask) and identify PPE and procedures related to PPE. (A3.2) (TSA 16)	12B.1.1.6 →	12C.1.1.6 →	12D.1.1.6 →
12A.1.1.7 Locate the first aid and eyewash stations.	12B.1.1.7 →	12C.1.1.7 →	12D.1.1.7 →
12A.1.1.8 Identify the process for reporting injuries.	12B.1.1.8 →	12C.1.1.8 →	12D.1.1.8 →
12A.1.1.9 Identify ergonomically correct procedures to avoid injury (e.g., stress, strain, lifting).	12B.1.1.9 →	12C.1.1.9 →	12D.1.1.9 →

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.1: Create and maintain a **safe work** environment in horticulture. *(continued)*

12A.1.1.10 Identify and outline workplace fire safety principles. (A3.10) (TSA 19)	12B.1.1.10 →	12C.1.1.10 →	12D.1.1.10 →
12A.1.1.11 Identify emergency evacuation and response procedures.	12B.1.1.11 →	12C.1.1.11 →	12D.1.1.11 →
12A.1.1.12 Identify potential hazards with regard to personal apparel and grooming.	12B.1.1.12 →	12C.1.1.12 →	12D.1.1.12 →
12A.1.1.13 Demonstrate awareness of the principles of the Workplace Hazardous Materials Information Systems (WHMIS) as they apply to the horticulture industry and identify safety requirements as they apply to WHMIS. (A3.11) (TSA 13)	12B.1.1.13 →	12C.1.1.13 →	12D.1.1.13 →
12A.1.1.14 Describe the purpose of Material Safety Data Sheets (MSDS).	12B.1.1.14 →	12C.1.1.14 →	12D.1.1.14 →

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.1: Create and maintain a **safe work** environment in horticulture. *(continued)*

12A.1.1.15 Discuss the need and purpose of safe handling and applications of chemical controls according to the label. (A3.4, A3.14)	12B.1.1.15 →	12C.1.1.15 →	12D.1.1.15 →
9.1.1.16 Identify the hazards associated with working in a confined space and the preparation required to work safely in a confined space. (A3.9) (TSA 20)	12B.1.1.16 →	12C.1.1.16 →	12D.1.1.16 →
12A.1.1.17 Identify the hazards and precautions related to working with and around horticulture and landscaping equipment. (A3.8)	12B.1.1.17 →	12C.1.1.17 →	12D.1.1.17 →
12A.1.1.18 Identify the need for a safety checklist in the landscaping and horticulture industries (e.g., chainsaw, power lawnmower, garden tractor).	12B.1.1.18 →	12C.1.1.18 →	12D.1.1.18 →

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual**
(www.gov.mb.ca/tce/apprent/apprentice/trade_safety/).

12A.1.2.1 Explain the importance of trade safety and health in reducing injuries and fatalities to young employees in Manitoba. (TSA 1)

12A.1.2.2 Describe the rights and responsibilities of employees, employers, and supervisors under the Workplace Safety and Health Act. (TSA 2)

12A.1.2.3 Describe the steps to use in the Right to Refuse process. (TSA 3)

12A.1.2.4 Explain how and where to find information on workplace safety and health. (TSA 4)

12A.1.2.5 Demonstrate how to handle a potentially dangerous work situation. (TSA 5)

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. (*continued*)

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual**
(www.gov.mb.ca/tce/apprent/apprentice/trade_safety/).

12A.1.2.6 Explain the S.A.F.E. acronym. (TSA 6)

12A.1.2.7 Define workplace safety and health hazards. (TSA 7)

12A.1.2.8 Give examples of trade-specific workplace safety and health hazards. (TSA 8)

12A.1.2.9 Give examples of five types of safety and health hazards. (TSA 9)

12A.1.2.10 Define workplace safety and health risks. (TSA 10)

12A.1.2.11 Give examples of trade-specific workplace safety and health risks. (TSA 11)

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Goal 1: Describe and apply appropriate **safety and health** practices as they relate to horticulture. *(continued)*

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual** (www.gov.mb.ca/tce/apprent/apprentice/trade_safety/).

12A.1.2.12 Explain the principles of hazard recognition and control as they apply to the specific trade. (TSA 12)

12A.1.2.13 Match the WHMIS hazardous materials symbols and their meanings. (TSA 14)

12A.1.2.14 Describe the importance of the Material Safety Data Sheets (MSDS). (TSA 15)

12A.1.2.15 Demonstrate proper selection and use of a variety of personal protective equipment and fall protection systems. (TSA 17)

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Goal 2: Demonstrate the safe and appropriate maintenance, management, and operation of equipment, tools, consumables, and materials. (GHCP B3)

GLO 2.1: Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials.

12A.2.1.1 Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials.	12B.2.1.1 Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials used in landscape maintenance and construction.	12C.2.1.1 Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials used in greenhouse maintenance and construction.	12D.2.1.1 Demonstrate the safe and appropriate maintenance and management of equipment, tools, consumables, and materials used in arboriculture.
12A.2.1.2 Demonstrate an awareness of safe handling and applications of chemical controls according to the label.	12B.2.1.2 →	12C.2.1.2 →	12D.2.1.2 →
12A.2.1.3 Develop a safety checklist related to landscaping and horticulture (e.g., chainsaw, power lawnmower, garden tractor).	12B.2.1.3 →	12C.2.1.3 →	12D.2.1.3 →
12A.2.1.4 Describe the procedures and equipment used to store, dispose of, and transport fertilizers. (D1.8)	12B.2.1.4 Perform routine maintenance for common hand tools and power equipment.	12C.2.1.4 →	12D.2.1.4 →

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Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials.** (GHCP B3) *(continued)*

GLO 2.1: Demonstrate the safe and appropriate **maintenance and management of equipment, tools, consumables, and materials.** *(continued)*

12B.2.1.5 Describe the safe storage of stock equipment in service vehicles. (A3.13)

12B.2.1.6 Describe the procedures used to inspect, maintain, sharpen, clean, and store hand and power tools. (A4.4, A4.6)

12B.2.1.7 Describe the procedures used to inspect, clean, maintain, and store measuring tools and equipment. (A4.8)

12B.2.1.8 Use and maintain hand, power, and measuring tools applicable to the workplace. (A4.9)

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Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials.** (GHCP B3) *(continued)*

GLO 2.2: Demonstrate the safe **operation of horticultural tools and equipment.** (GHCP C1)

<p>12A.2.2.1 Demonstrate the safe operation of horticultural tools and equipment.</p> <p>12A.2.2.2 Demonstrate the ability to select and use measuring and hand tools, and power equipment for a task. (A4.3, A4.5, A4.7)</p>	<p>12B.2.2.1 Demonstrate the safe operation of tools and equipment used in landscape maintenance and construction.</p> <p>12B.2.2.2 —→</p> <p>12B.2.2.3 Identify hazards and describe safe work practices pertaining to vehicles/trailers, equipment, and machinery. (A5.1)</p> <p>2B.2.2.4 Describe the implications of vehicle, equipment, and machinery selection and use on the practice of environmental stewardship. (A5.2)</p> <p>2B.2.2.5 Interpret codes and regulations pertaining to vehicles/trailers, equipment, and machinery. (A5.3)</p>	<p>12C.2.2.1 Demonstrate the safe operation of tools and equipment used in greenhouse maintenance and production.</p>	<p>12D.2.2.1 Demonstrate the safe operation of tools and equipment used in arboriculture.</p> <p>12D.2.2.2 Demonstrate the ability to select and use measuring and hand tools, and power equipment for a task. (A4.3, A4.5, A4.7)</p>
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Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials.** (GHCP B3) *(continued)*

GLO 2.2: Demonstrate the safe **operation of horticultural tools and equipment.** (GHCP C1) *(continued)*

12B.2.2.6 Identify types of engines and describe their characteristics, applications, and operation. (A5.4)

12B.2.2.7 Identify basic vehicle systems and components, and describe their characteristics and operation. (A5.5)

12B.2.2.6 Describe the daily/seasonal operating procedures used to inspect, clean, and maintain engines. (A5.6)

12B.2.2.9 Identify types of equipment and machinery, and describe their characteristics, applications, and operation. (A5.7)

12B.2.2.10 Describe the daily/seasonal operating procedures used to inspect, maintain, clean, and store equipment. (A5.8)

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Goal 2: Demonstrate the safe and appropriate **maintenance, management, and operation of equipment, tools, consumables, and materials.** (GHCP B3) *(continued)*

GLO 2.2: Demonstrate the safe **operation of horticultural tools and equipment.** (GHCP C1) *(continued)*

12B.2.2.11 Describe the procedures used to load/unload, secure, and transport tools, equipment, and machinery. (A5.9)

12B.2.2.12 Describe the daily/seasonal operating procedures used to inspect, maintain, clean, and store vehicles/trailers. (A5.10)

12B.2.2.13 Describe the operating procedures used when hauling a trailer. (A5.11)

12B.2.2.14 Demonstrate the ability to operate, clean, and maintain vehicles and trailers. (A5.12)

12B.2.2.15 Demonstrate the ability to operate, clean, and maintain equipment and machinery. (A5.13)

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Goal 3: Demonstrate an understanding of the **fundamentals of horticulture.**

GLO 3.1: Demonstrate a basic knowledge of **plant anatomy, morphology, and physiology.**

12A.3.1.1 Describe plant anatomy and morphology.

12A.3.1.2 Describe the factors that impact plant growth and development.

12A.3.1.3 Describe taxonomy and the binomial system of naming plants.

12A.3.1.4 Identify plants by common and botanical names, and family names.

12A.3.1.5 Design and plant container gardens.

12A.3.1.6 Identify plant nutrients and describe the impact of nutrient deficiencies/excesses on plants and plant growth.
(B2.5)

12D.3.1.1 Describe woody plant morphology, anatomy, and physiology.

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Goal 3: Demonstrate an understanding of the **fundamentals of horticulture.** *(continued)*

GLO 3.2: Identify and select plants.

12A.3.2.1 Describe the characteristics of plants that influence their use. (A6.3)	12B.3.2.1 Demonstrate the ability to choose an appropriate selection of plants to be established in a landscaped environment under given conditions. (A6.7, A6.8)	12C.3.2.1 Demonstrate the ability to choose an appropriate selection of plants to be utilized for greenhouse production. (A6.7, A6.8)	12D.3.2.1 Demonstrate the ability to choose an appropriate selection of trees to be established in a landscaped environment under given conditions. (A6.7, A6.8)
12A.3.2.2 Describe how each species is used in horticulture. (A6.3) (GHCP A4)	12B.3.2.2 Describe how each species is used in landscape maintenance and construction. (GHCP A4)	12C.3.2.2 Describe how various species are used in a greenhouse. (GHCP A4)	12D.3.2.2 Describe how each species is used in arboriculture. (GHCP A4)
12A.3.2.3 Describe the environmental conditions for the optimal growth of each species.			12D.3.2.3 Describe the environmental conditions for the optimal growth of each species.

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Goal 3: Demonstrate an understanding of the **fundamentals of horticulture.** *(continued)*

GLO 3.3: Demonstrate an understanding of **plant care.** (GHCP B2)

12A.3.3.1 Perform the maintenance of plants in a container garden.	12B.3.3.1 Perform the maintenance of new and established plants in a landscaped environment.	12C.3.3.1 Perform the maintenance of plants in a greenhouse.	12D.3.3.1 Perform the maintenance on trees.
12A.3.3.2 Describe the procedures and equipment used for the application of fertilizers. (D1.7)	12B.3.3.2 —→	12C.3.3.2 —→	
12A.3.3.3 Calibrate application equipment. (D1.9)	12B.3.3.3 —→	12C.3.3.3 —→	
12A.3.3.4 Identify types of fertilizers and describe their characteristics and applications. (D1.4)			
12A.3.3.5 Describe the analysis and formulation of fertilizers. (D1.6)			

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Goal 4: Demonstrate an understanding of **soils and growing media.**

GLO 4.1: Demonstrate an understanding of **soils and growing media.**

12A.4.1.1 Demonstrate knowledge of and utilize soil science terminology.	12B.4.1.1 Perform field soil assessments.	12C.4.1.1 Describe the differences between soils and growing media.	12D.4.1.1 Describe the effects of urban soils on trees.
12A.4.1.2 Apply knowledge of the physical characteristics of soil when determining suitability for plant growth. (A9.1)	12B.4.1.2 Select plants based on the results of soil assessments.	12C.4.1.2 Describe the characteristics of growing media.	12D.4.1.2 Perform field soil assessments for the purpose of tree establishment and maintenance.
12A.4.1.3 Apply knowledge of the types of media, their characteristics, and their applications when growing plants. (A9.3)	12B.4.1.3 Determine and apply cultural practices based on soil assessments.	12C.4.1.3 Select growing media based on plant characteristics.	12D.4.1.3 Select woody plants based on the results of soil assessments.

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Goal 4: Demonstrate an understanding of **soils and growing media.** (*continued*)

GLO 4.2: Demonstrate knowledge of the **effects of soils and growing media on plants.** (GHCP A7)

12A.4.2.1 Apply the chemical and biological properties of soils and growing media when growing plants. (A9.4)	12B.4.2.1 Describe the procedures for taking soil samples. (A9.5, A9.6)	12C.4.2.1 Demonstrate knowledge of the atmospheric conditions in a greenhouse that influence water availability when growing plants.	12D.4.2.1 Determine and apply arboricultural practices based on soil assessments.
12A.4.2.2 Apply knowledge of the process of soil water and nutrient uptake by roots when growing plants.	12B.4.2.2 Describe types of soil amendments, their characteristics, and their applications. (A9.7)		12D.4.2.2 Conduct a soil sample and interpret results. (A9.12)
12A.4.2.3 Apply knowledge of the atmospheric conditions that influence soil water availability when growing plants.	12B.4.2.3 Describe the considerations when selecting soil amendments for plants. (A9.8)		12D.4.2.3 Identify the considerations when selecting soil amendments for tree establishment and maintenance. (A9.8)
12A.4.2.4 Describe the process of soil water and nutrient uptake by roots.	12B.4.2.4 Describe the procedures to select and incorporate soil amendments for plants. (A9.9)		

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Goal 4: Demonstrate an understanding of **soils and growing media**. *(continued)*

GLO 4.2: Demonstrate knowledge of the **effects of soils and growing media on plants**. (GHCP A7) *(continued)*

12B.4.2.5 Describe the procedures used to store, transport, and dispose of soil, and soil amendment products and packaging. (A9.10)

12B.4.2.6 Select and incorporate soil amendments. (A9.11)

12B.4.2.7 Conduct a soil sample and interpret results. (A9.12)

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Goal 5: Understand pest management.

GLO 5.1: Understand the principles of **integrated pest management.**

12A.5.1.1 Describe the significance of pests.

12A.5.1.2 Describe pest biology in terms of IPM.

12A.5.1.3 Identify common pests.

12A.5.1.4 Identify damage caused by pests.

12A.5.1.5 Describe the difference between IPM and conventional pest management.

12A.5.1.6 Describe the ecological concepts related to IPM.

12A.5.1.7 Describe pest control techniques.

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Goal 6: Demonstrate an understanding of the principles of **plant installation and propagation.**

GLO 6.1: Demonstrate an understanding of the principles of **plant installation and propagation.**

12A.6.1.1 Install plant material. (GHCP B1)	12B.6.1.1 →	12C.6.1.1 →	12D.6.1.1 →
12A.6.1.2 Demonstrate different methods of plant propagation.		12C.6.1.2 Demonstrate different methods of plant propagation in a greenhouse.	

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Goal 7: Demonstrate an understanding of the principles of **crop production and management.**

GLO 7.1: Demonstrate an understanding of **crop production.**

12C.7.1.1 Practise pre-harvest and post-harvest tasks that affect quality.

12C.7.1.2 Plan a greenhouse crop.

12C.7.1.3 Grow crops suitable for greenhouse production.

GLO 7.2: Demonstrate an understanding of **crop management.**

12C.7.2.1 Propose practices to improve plant quality.

12C.7.2.2 Manipulate cultural practices that affect crop production.

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Goal 8: Demonstrate an understanding of the **construction techniques** relevant to the horticulture industry.

GLO 8.1: Identify and demonstrate different **construction techniques**.

12B.8.1.1 Extract information from landscape plans and documentation, and layout a construction project with assistance. (C1.4)

12B.8.1.2 Assist in the layout of a modest construction project from drawings and other related documents. (GHCP C2)

12B.8.1.3 Demonstrate knowledge of pre-construction procedures. (GHCP C3)

12B.8.1.4 Construct basic hardscape elements. (GHCP C3)

12B.8.1.5 Construct basic site grading and preparation. (GHCP C3)

12B.8.1.6 Install basic irrigation and drainage. (GHCP C3)

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Goal 8: Demonstrate an understanding of the **construction techniques** relevant to the horticulture industry.
(continued)

GLO 8.1: Identify and demonstrate different **construction techniques**. (continued)

12B.8.1.7 Construct/install
basic softscape elements.
(GHCP C3)

12B.8.1.8 Demonstrate
knowledge of infrastructure
maintenance. (GHCP B4)

Goal 9: Demonstrate an understanding of **career opportunities** in horticulture and related environmental fields.
(GHCP D1)

GLO 9.1: Describe **education and career opportunities, and professional organizations** in horticulture and related
environmental fields.

12A.9.1.1 Describe education
and career opportunities, and
professional organizations
in horticulture and related
environmental fields.

12A.9.1.2 Prepare and deliver
an informal presentation
related to an industrial topic.
(A10.6)

12B.9.1.1 Describe education
and career opportunities, and
professional organizations in
landscape management and
construction.

12C.9.1.1 Describe education
and career opportunities, and
professional organizations in
greenhouse maintenance and
production.

12D.9.1.1 Describe education
and career opportunities, and
professional organizations in
arboriculture.

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Goal 10: Describe and demonstrate the transferable, **cross-curricular** knowledge and skills as they pertain to horticulture.

GLO 10.1: Read, interpret, and communicate information relevant to horticulture.

12A.10.1.1 Read, interpret, and communicate information relevant to horticulture.	12B.10.1.1 Read, interpret, and communicate information relevant to landscape maintenance and construction.	12C.10.1.1 Read, interpret, and communicate information relevant to greenhouse maintenance and production.	12D.10.1.1 Read, interpret, and communicate information relevant to arboriculture.
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GLO 10.2: Apply mathematics knowledge and skills relevant to horticulture.

	12B.10.2.1 Estimate materials required for landscape structures. 12B.10.2.2 Estimate time to complete tasks.		
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GLO 10.3: Apply other subject areas (art, physical education/health education) knowledge and skills relevant to horticulture.

	12B.10.3.1 Incorporate design principles to create a landscape plan. 12B.10.3.2 Demonstrate knowledge of First Aid and CPR. (A3.10)		
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Goal 11: Demonstrate awareness of **sustainability** as it pertains to horticulture.

GLO 11.1: Describe the impact of **sustainability** on the health and well-being of horticulture workers and their clients, as well as the role of horticulture in society.

12B.11.1.1 Discuss the benefits of landscape structures to human health and well-being.

12C.11.1.1 Discuss the benefits of greenhouses, their ambiance, and their produce to human health and well-being.

12D.11.1.1 Discuss the benefits of trees to human health and well-being.

GLO 11.2: Describe the horticulture industry’s **sustainability practices and environmental impacts**.

12A.11.2.1 Describe sustainability practices and the environmental impacts of horticulture (e.g., xeriscaping, water gardens).

12B.11.2.1 Describe sustainability practices and the environmental impacts of landscape structures.

12C.11.2.1 Describe sustainability practices and the environmental impacts of greenhouses.

12D.11.2.1 Describe sustainability practices and the environmental impacts of arboriculture.

12A.11.2.2 Describe the implications of soil management on the practice of environmental stewardship. (A9.2)

GLO 11.3: Describe **sustainable business practices** within the horticulture industry.

12B.11.3.1 Discuss sustainable business practices that pertain to the maintenance and construction of landscape structures.

12C.11.3.1 Discuss sustainable business practices that pertain to the maintenance and management of greenhouses.

12D.11.3.1 Discuss sustainable business practices that pertain to arboriculture.

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Goal 12: Demonstrate awareness of the **ethical and legal standards** as they pertain to horticulture.

GLO 12.1: Apply the **ethical and legal standards** as they pertain to horticulture.

<p>12A.12.1.1 Demonstrate awareness of legislation controlling the use of horticultural products.</p> <p>12A.12.1.2 Discuss ethical considerations regarding the disposal of hazardous products.</p> <p>12A.12.1.3 Interpret codes and regulations pertaining to fertilizers. (D1.5)</p>	<p>12B.12.1.1 Demonstrate awareness of legal land surveys and building codes.</p> <p>12B.12.1.2 Demonstrate awareness of legislation governing the application of potentially hazardous horticultural products.</p>	<p>12C.12.1.1 Demonstrate awareness of patented plant material.</p>	<p>12D.12.1.1 Demonstrate awareness of legislation governing arborists.</p>
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Goal 13: Demonstrate **employability skills** related to horticulture. (GHCP D1) (GHCP D4)

GLO 13.1: Demonstrate **fundamental employability skills**.

12A.13.1.1 Arrive on time and be prepared for work.	12B.13.1.1 →	12C.13.1.1 →	12D.13.1.1 →
12A.13.1.2 Meet deadlines.	12B.13.1.2 →	12C.13.1.2 →	12D.13.1.2 →
12A.13.1.3 Use time effectively.	12B.13.1.3 →	12C.13.1.3 →	12D.13.1.3 →
12A.13.1.4 Follow written and oral directions.	12B.13.1.4 →	12C.13.1.4 →	12D.13.1.4 →
12A.13.1.5 Ask questions for clarification.	12B.13.1.5 →	12C.13.1.5 →	12D.13.1.5 →
12A.13.1.6 Initiate work independently.	12B.13.1.6 →	12C.13.1.6 →	12D.13.1.6 →
12A.13.1.7 Work effectively without supervision.	12B.13.1.7 →	12C.13.1.7 →	12D.13.1.7 →
12A.13.1.8 Complete tasks without supervision.	12B.13.1.8 →	12C.13.1.8 →	12D.13.1.8 →
12A.13.1.9 Fulfill commitments to self and others.	12B.13.1.9 →	12C.13.1.9 →	12D.13.1.9 →

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Goal 13: Demonstrate **employability skills** related to horticulture. (GHCP D1) (GHCP D4) *(continued)*

GLO 13.1: Demonstrate **fundamental employability skills.** *(continued)*

12A.13.1.10 Perform tasks to a high standard.	12B.13.1.10 →	12C.13.1.10 →	12D.13.1.10 →
12A.13.1.11 Cooperate with others.	12B.13.1.11 →	12C.13.1.11 →	12D.13.1.11 →
12A.13.1.12 Act respectfully towards oneself and others.	12B.13.1.12 →	12C.13.1.12 →	12D.13.1.12 →
12A.13.1.13 Participate in group activities.	12B.13.1.13 →	12C.13.1.13 →	12D.13.1.13 →
12A.13.1.14 Dress appropriately for the workplace.	12B.13.1.14 →	12C.13.1.14 →	12D.13.1.14 →
12A.13.1.15 Demonstrate appropriate site etiquette. (GHCP D3)	12B.13.1.15 →	12C.13.1.15 →	12D.13.1.15 →
12A.13.1.16 Maintain a clean and organized work area. (A3.3)	12B.13.1.16 →	12C.13.1.16 →	12D.13.1.16 →

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Goal 14: Demonstrate an understanding of the **evolution and technological progression of, and the emerging trends in** horticulture.

GLO 14.1: Demonstrate an understanding of the **evolution and technological progression of, and the emerging trends in** horticulture.

12A.14.1.1 Describe the evolution and technological progression of, and the emerging trends in horticulture.	12B.14.1.1 Describe the evolution and technological progression of, and the emerging trends in landscape maintenance and construction.	12C.14.1.1 Describe the evolution and technological progression of, and the emerging trends in greenhouse maintenance and production.	12D.14.1.1 Describe the evolution and technological progression of, and the emerging trends in arboriculture.
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