Charting a Path to Greening the Trades

Charting a Path to Greening the Trades

A FACULTY TRAINING MODULE FOR LANDSCAPE HORTICULTURE

REGENERATE (TO RENEW/RESTORE/ RESPECT)

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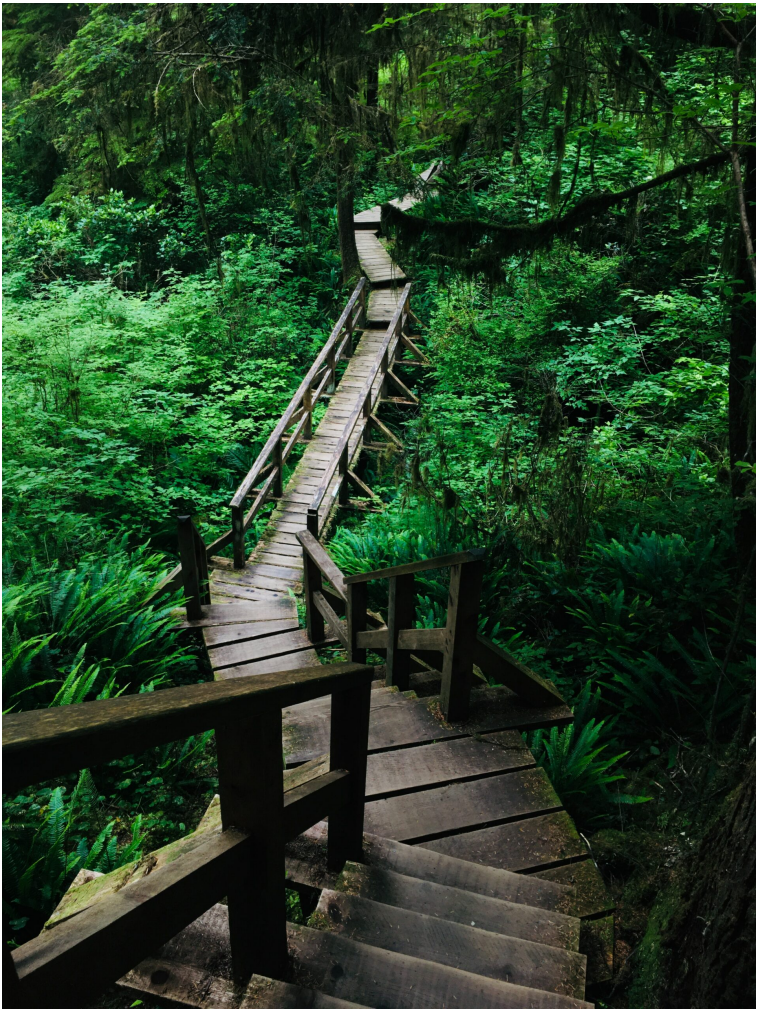
A Faculty Training Module for Landscape Horticulture



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Faculty Training Module (FTM) Details

Audience

While this textbook was originally designed for horticulture educators teaching horticulture students across Canada, the authors recognize the benefits of sharing this FTM with a wider audience who may be interested in enhancing their pedagogy and the curriculum through the inclusion of green mindsets, skills, and practices in the horticulture industry.

Textbook Details

Current Textbook Title: Charting a Path to Greening the Trades: A Faculty Training Module for Landscape Horticulture.

Time Commitment: From the onset, this FTM was designed to be completed within a five-hour timeframe, providing learners with the flexibility to access it at their own pace and convenience. However, we acknowledge that learning is a timeless and endless journey, and therefore, it may take longer or shorter depending on the individual learner.

Learners are encouraged to take breaks and collaborate with colleagues, friends, and family, or to reach out and make new connections as needed to optimize their learning experience.

Sowing Seeds: The authors anticipate that this learning will span a lifetime and encourage the learner to be open to continuous learning.

Harvesting Carrots: The authors hope that learners will gain insight into the relationship between their personal

teaching philosophy and its influence on students' learning. We hope this module encourages horticulture educators to explore how they can chart a path to greening themselves, the curriculum, and the horticulture industry.

Registration fee: None

Recommended Pre-Viewing and Pre-Readings

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https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=61#oembed-1

Video Credit: Phoebe Lyn Pinkner (2022)

Braiding Sweet Grass by Robin Wall Kimmer

Nature's Best Hope by Douglas Tallamy

Accessibility of this Faculty Training Module (FTM)

Photo by Matt LaVasseur on Unsplash

The web version of this resource aims to meet Web Content Accessibility Guidelines 2.0, level AA. In addition, it aims to meet the guidelines in Appendix A: Checklist for Accessibility of the *Accessibility Toolkit – 2nd Edition*. It includes:

- **Easy navigation**. This text has a linked table of contents and uses headings in each chapter to make navigation easy.
- **Accessible videos**. Whenever possible, videos in this text have captions.
- **Accessible images**. All images in this text that convey information have alternative text. Decorative

images have empty alternative text

- **Accessible links**. All links use descriptive link text.

Content sources: Whenever possible, authentic voices and Canadian-developed resources were selected to provide the learner with relevant content and examples. As a result, some of the resources provided may not suit the level of every learner or fit seamlessly into the faculty training module (FTM).

The resources included in the FTM are examples for horticulture educators; however, if educators are pulling from these resources, each resource should be critically analyzed to ensure it is appropriate, relevant, and respectful for each educator, place, context, and learner group.

Open Educational Resource (OER)

This faculty training module is an open educational resource (OER). "OER are teaching resources that have an open-copyright licence (such as one from Creative Commons), or they are part of the public domain and have no copyright. Depending on the licence used, OER can be freely accessed, used, re-mixed, improved, and shared" (BCCampus).

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As BCCampus (2023) notes, "education in Canada is exclusively a provincial or territorial responsibility; we do not have a formal federal presence to connect open activities on a national level."

Open Education Information by Province and Territory

PROVINCE/TERRITORY CONTACT

- **Alberta**: See Alberta information
- **British Columbia:** See British Columbia information
- **Manitoba**: See Manitoba information
- **New Brunswick**: See New Brunswick information
- **Newfoundland & Labrador**: See Newfoundland & Labrador information
- **Northwest Territories:** See Northwest Territories information
- **Nova Scotia**: See Nova Scotia information
- **Nunavut**: See Nunavut information
- **Ontario:** See Ontario information
- **Prince Edward Island:** See Prince Edward Island information
- **Québec**: See Québec information
- **Saskatchewan**: See Saskatchewan information
- **Yukon**: See Yukon information

Here is an example of a horticulture-specific OER created by Michelle Nakano that is free for anyone to use and learn from: Red Seal Landscape Horticulturist Identify Plants and Plant Requirements (F2 – 1&2).

In this faculty training module, the reflections, resources, and content are examples of open educational resources (OER),

which means learners (that's you!) can use and adapt the examples to suit their local context and diverse student learning needs while giving appropriate credit. However, it's important to note that it's not appropriate to take the thoughts, ideas, or knowledge collected in the module without providing appropriate credit.

With that in mind, a gentle reminder to please give credit to those who created the work or generously shared knowledge or an idea.

Creative Commons

Creative Commons (CC) is a global body that provides open-copyright licences, so as an author, you can give your permission to share and reuse your creative work, with the conditions you choose.

Learn more about the various types of Creative Commons licences.

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The License for this Faculty Training Module (FTM)

The license for this FTM was determined by the Colleges and Institutes of Canada (CICan), who also provided collaboration coordination and funding for this project.

> "Copyright subsists in these training modules. CICan holds the copyright with the intent to always make them fully accessible. Under a Creative Commons license CICan authorizes users to copy and distribute the modules in any medium or format as long as the modules are not changed, and use is for non-commercial purposes only. At no time will CICan seek to profit from these modules or the Indigenous wisdom contained within them. These modules were co-developed with member institutes. We would like to express gratitude to all the people that contributed to the creation of these modules and acknowledge the Indigenous wisdom that is woven into them" (Colleges and Institutes of Canada, 2024).

The Creative Commons license attributed to this FTM is:

You can learn more about the licence above through the

Creative Commons website (click on the blue link to go to the webpage).

This open educational resource is not being monitored and may not include up-to-date information.

How this Faculty Training Module (FTM) was Developed

Photo Credit: Sam Barber on Unsplash

This faculty training module was developed under the guidance and funding of the College and Institutes of Canada (CICAN).

From December 2022 to February 2024, a keen and diverse group of Indigenous scholars, technical, vocational education and training (TVET) educators, tradespeople, teaching and curriculum specialists, and subject matter experts (SME) collaborated as a pan-Canadian team to design and develop industry-specific faculty training modules (FTM) to enhance the existing pan-Canadian Trades curriculum. This FTM for landscape horticulture is one of four modules that are housed

within a larger CICAN book, alongside carpentry, electrical, and heating, venting, and air conditioning (HVAC).

While smaller, industry-specific teams developed the individual FTM, the larger project team met once a month to engage in three-hour workshops to develop our understanding of the project, its goals, and the relevant topics that should be included in the FTMs. The three-hour workshops were hosted by CICAN, and guest speakers, including EcoCanada, Grey and Ivy. During this time, the workshop presenters shared knowledge and experiences from their areas of expertise and invited the group to build capacity and find new meaning in this work.

Approximately ten months into the project, the FTMs were circulated for review and peer feedback to Indigenous scholars and industry-relevant instructors across Canada for three months. The anonymous qualitative and quantitative peer feedback was returned to the FTM developers, who spent the remaining two months reframing and incorporating the feedback into the FTMs.

Through the work of personal reflection and discovery, research on relevant topics, joyous and challenging conversations, and peer feedback from Indigenous scholars and SME educators from across Canada, the project transformed and took shape into its current form, titled Charting a Path to Greening the Trades.

During this time, the meaning of the word *greening* also transformed. The transformation unfolded as our understanding of the word *greening* grew and was reframed to encompass a wider, more holistic meaning. Within this FTM, you will engage with the topics encompassed within the word *greening,* ranging from adaptive horticulture practices and strategies to combat the challenges of climate change, Two-

eyed seeing, Indigenous Knowledge and perspectives, decolonization, and technical, vocational, education, and training (TVET) pedagogy.

In every way, credit for this FTM goes to the numerous contributors, peer-reviewers, and knowledge-sharers along the journey. For this, we are grateful.

United Nations Sustainable Development Goals (SDGs)

The United Nations Sustainable Development Goals were referred to for guidance and direction in the development of this faculty training module, specifically:

- #9 Industry, Innovation and Infrastructure
- #11 Sustainable Cities and Communities
- #13 Climate Action
- #15 Life on Land

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"The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet,

now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

The SDGs build on decades of work by countries and the UN, including the UN Department of Economic and Social Affairs.

Today, the Division for Sustainable Development Goals (DSDG) in the United Nations Department of Economic and Social Affairs (UNDESA) provides substantive support and capacity-building for the SDGs and their related thematic issues,
including water, energy, climate, oceans, urbanization, transpo rt, science and technology, the Global Sustainable Development Report (GSDR), partnerships and Small Island Developing States. DSDG plays a key role in the evaluation of UN systemwide implementation of the 2030 Agenda and on advocacy and outreach activities relating to the SDGs. In order to make the 2030 Agenda a reality, broad ownership of the SDGs must translate into a strong commitment by all stakeholders to implement the global goals. DSDG aims to help facilitate this engagement" (United Nations, n.d.).

First Peoples Principles of Learning

The authors acknowledge the First Peoples Principles of Learning, which were referred to for guidance and direction in the development of this faculty training module.

- Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.
- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions.
- Learning involves generational roles and responsibilities.
- Learning recognizes the role of Indigenous knowledge.
- Learning is embedded in memory, history, and story.
- Learning involves patience and time.
- Learning requires exploration of one's identity.
- Learning involves recognizing that some knowledge is sacred and only shared with permission and/or in certain situations

(First Nations Education Steering Committee, 2023)

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https://pressbooks.bccampus.ca/

facultytrainingmodulesforgreeningthelandscapetrade/?p=1000#oembed-2

"*The First Peoples Principles of Learning* describes a set of learning principles specific to First Peoples. These were articulated by Indigenous Elders, scholars, and knowledge keepers to guide the development of the curriculum and teaching of the English First Peoples course created by the BC Ministry of Education and First Nations Education Steering Committee in 2006/2007" (First Nations Education Steering Committee, 2023).

Two-eyed-seeing

The authors acknowledge Two-Eyed Seeing, which was referred to for guidance and direction in the development of this faculty training module.

As noted in the online book Pulling Together: A Guide for Curriculum Developers, "Elder Albert Marshall from the Eskasoni Mi'kmaq First Nation (2012) describes *Etuaptmumk*, the approach of two-eyed seeing, as a way to learn to appreciate both Indigenous and Western knowledges and ways of knowing, and he says that using these two perspectives can be to our benefit. He contends that by fostering an active engagement with both ways of seeing, we are providing all students with support systems to move toward a decolonized academy".

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view them online here: https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1000#oembed-3

Video Credit: Government of BC (2016)

Pulling Together: Professional Learning Series

The authors refer to the Pulling Together: Professional Learning Series for guidance and direction in the development of this faculty training module.

https://bccampus.ca/projects/archives/indigenization/indigenization-guides/

"These guides are the result of a collaboration between BCcampus and the Ministry of Post-Secondary Education and Future Skills. The project was led by a steering committee of Indigenous education leaders from B.C universities, colleges, and institutes, the First Nations Education Steering Committee, the Indigenous Adult and Higher Learning Association, and Métis Nation BC" (BCCampus, 2023).

Additional Resources:

Name	Website
UNESCO International Centre for Technical and Vocational Education and Training Greening Curricula and Training	https://unevoc.unesco.org/home/Greening+curricula+and+training
UN Sustainable Development Goals	https://sdgs.un.org/goals
BC Campus Indigenization Guides Pulling Together: Professional Learning Series	https://bccampus.ca/projects/archives/indigenization/indigenization-guides/
First Nations Education Steering Committee: First Peoples Principles of Learning	https://www.fnesc.ca/first-peoples-principles-of-learning/

Situating this Faculty Training Module

Photo by Annie Spratt on Unsplash

An Offering

Charting a Path for Greening the Trades: A Faculty Training Module for Landscape Horticulture represents a snapshot of knowledge and practices at the time of creation. Equally important, this faculty training module is not perfect; however, it's an attempt to share ideas and practical ways to start adjusting pedagogy and practices to address complex local, regional, and global issues.

Recognizing that learning is a dynamic and continuous journey, the ideas and content presented here reflect an understanding of particular perceptions, times, and places. With the acknowledgement that the landscape of personal and

collective knowledge in this area will evolve, learners are encouraged to embrace this module as a starting point on their ongoing journey to greening their pedagogy and practices. Learners are encouraged to stay curious, remain open to new insights, and explore additional resources as the field of landscape horticulture and sustainability evolves.

Photo by Justin Ziadeh on Unsplash

Technical, Vocational Education and Training (TVET)

Regenerate (to renew/restore/respect)

As horticulture educators, a major element of our job is to prepare students with theoretical knowledge and technical skills to support their successful integration and leadership in the horticulture industry. In navigating this responsibility, pedagogy becomes crucial, as it refers to the variety of choices that educators make, impacting both the content (what we

teach) and the mode of instruction (how we teach). In fact, some experts in TVET teaching and learning say that pedagogy and curriculum choices are the same (Vinden, 2020). In other words, we teach who we are, and this influences the culture of learning and, by extension, the culture of the horticulture industry.

Vocational pedagogy is defined as "the science, art, and craft of teaching and learning in TVET [technical, vocational education, and training]" (Lucas, 2014, p.5). TVET instructors are industry experts who often transition into education as a second career, shifting identities to strike a balance between tradesperson and educator. To achieve this transition, it is essential to develop a personal teaching philosophy that transforms skillsets from knowing what to teach to knowing how to teach (Lucas, 2014). Lee Shulman's concept of signature pedagogy has been used as a pathway to unearth the root of what shapes TVET instructors' vocational pedagogy (Lucas, 2014). Lucas explains the concept of signature pedagogy as "types of teaching that organize the fundamental ways in which future practitioners are educated for their new professions" (p.52).

A key theme in TVET stems from the notion that "vocational pedagogy is the sum total of the many decisions that vocational teachers take as they teach, adjusting their approaches to meet the needs of learners and to match the context in which they find themselves (Lucas, 2014). In other words, in addition to learning outcomes and skills, TVET instructors' choices in teaching and learning design and delivery direct students to develop skills that represent the "personalities, dispositions, and cultures" of a certain profession (Shulman, 2005, p.52).

Historically, the TVET curriculum has been predominantly designed and delivered from a skilled-based approach that

orients the learner to value the practical application of knowledge (Hordern, 2014; Lucas, 2014). However, there is currently a shift in vocational pedagogy that is moving away from isolated skills-based learning and recognizes TVET as a pathway for students to develop wider skills needed to effectively contribute to changing industries and societies (Lucas & Claxton, 2009).

Landscape Horticulture Curriculum in Canada

Landscape horticulture is a pan-Canadian harmonized certification program administered through the Canadian Council of Directors of Apprenticeship (CCDA) which is responsible for apprenticeship training and trade certification. The pan-Canadian harmonization process aims to align apprenticeship systems across Canada by making apprenticeship training requirements more consistent in the Red Seal trades. The CCDA comprises 15 members, including one official from each province and territory and two federal government representatives from the Department of Employment and Social Development Canada. The CCDA as a body, does not have any regulatory powers regarding training and certification in the skilled trades. However, the individual CCDA directors of apprenticeship and their organizations may hold regulatory powers through specific provincial or territorial legislation. Provinces and Territories have individual certification bodies that support the credentialing of trades; for example, in British Columbia (BC), the trades certification body is Skilled Trades BC.

As each Province and Territory is responsible for credentialing, they also have oversight and authority over the training providers who can provide the horticulture

curriculum. Within each public or private post-secondary institution or training provider are curriculum and educational standards committees, which provide input to TVET faculties and finally to TVET instructors on the delivery of the horticulture curriculum. However, the horticulture instructor serves as the closest link between the horticulture curriculum and the student in the learning ecosystem.

Therefore, the instructor has an essential task of reflecting on how they may shape student perceptions of the horticulture curriculum and the culture of the horticulture industry through their teaching design and delivery (also known as pedagogy or curriculum culture).

Enhancing Pedagogy and Landscape Horticulture Curriculum

Image from Getty Images

There are two primary drivers for the need to enhance pedagogy and landscape horticulture curriculum in Canada.

First is the commitment from Canadian post-secondary universities and colleges and institutes to integrate the United Nations' sustainable development goals into TVET. It's widely known that TVET industries are leading contributors to carbon emissions, which contribute to global warming. Therefore, a central goal of the project is to target landscape horticulture, a subset of TVET, by providing tangible examples of how to reframe curriculum and pedagogy to include information and context on carbon emissions and adaptive mindsets, theories, and practices.

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Video from UNESCO International Centre for Technical, Vocational Education and Training

Change is needed to Green (the already green) Landscape Horticulture

The horticulture industry is facing the challenge of adapting to the changing climate, and as such, the theory, skills, and practices taught in horticulture skilled trades programs need to evolve to present solutions that prepare students for a changing industry. In response, horticulture instructors can choose to adjust their pedagogies and enhance the existing curriculum to include theories and adaptive practices for addressing complex global issues. In doing so, it's possible to reframe and shape the knowledge and skills shared with horticulture students, preparing them to effectively engage in current and future work in the horticulture industry. Ultimately, instructors can serve students by equipping them with the necessary green mindset and skills to take on diverse and dynamic leadership roles within the horticulture industry.

Change is More than a Green Mindset and Skills

However, the change needed extends beyond adjusting pedagogy and horticultural practices to incorporate green

mindsets and skills in response to climate change. Instigating meaningful change involves respectfully delving into the historical and cultural influences that contributed to the current situation, thereby shaping the need for change. Throughout Canada's history, education systems have been moulded by the prevailing societal consensus, driven by political, economic, and societal beliefs that reflect the values of specific eras and trajectories. Consequently, "education systems reflect the values of societies, both through the knowledge they consider worth teaching and the skills they hope to develop through the study of those topics and themes" (Lucas & Claxton, 2009, p. 8).

Looking Back: Truth and Reconciliation

The second primary driver for the need to enhance the landscape horticulture curriculum in Canada is in response to the United Nations Declaration on the Rights of Indigenous Peoples the 94 Calls to Action recommended in the 2015 Truth and Reconciliation Commission. As reported in Inspire's research, *Truth and Reconciliation in Post-Secondary Settings: Student Experience* (2018), "nineteen of these Calls to Action have direct implications for post-secondary settings and those working within these settings" (p.6).

It is acknowledged that all of the Calls to Action are equally important; however, this module was developed to raise awareness and respond to the Calls to Action related to post-secondary, TVET, and landscape horticulture, specifically:

Number 57: Professional Development and Training for Public Servants "We call upon federal, provincial, territorial, and municipal governments to provide education to the public servants on the history of Aboriginal peoples, including the

history and legacy of residential schools, the United Nations Declaration on the Rights of Indigenous Peoples, Treaties and Aboriginal rights, Indigenous law, and Aboriginal-Crown relations. This will require skills-based training in intercultural competency, conflict resolution, human rights, and anti-racism (p.7)".

and

Number 62: Education for Reconciliation: "We call upon the federal, provincial, and territorial
governments, in consultation and collaboration with Survivors, Aboriginal peoples, and educators, to:
ii."Provide the necessary funding to post-secondary institutions to educate teachers on how to integrate Indigenous knowledge and teaching methods into classrooms" (p.7).

Grounding in Truth before Reconciliation

Recognizing and addressing the injustices, marginalization, and cultural erasure experienced by Indigenous Peoples and communities throughout the history of Canada and the educational landscape is an integral part of fostering genuine Truth, understanding, and inclusivity.

Let's take a deeper look at the history of Canada, the history of education in Canada, and the history of the development of landscape horticulture curricula. We can identify the voices that determined how the horticulture curriculum was developed, what was included in the curriculum, and who the curriculum was meant to serve. In doing so, it's evident that Indigenous Knowledge, perceptions or world views, voice, and ways of learning and doing are missing, and this has a consequence for what has been historically taught and how it has been taught.

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Speaker: Chief Robert Joseph shares his experience as a residential school survivor and the importance of truth and reconciliation in Canada.

By acknowledging the historical roots and the Truth that have shaped current societies and education systems, we can work towards a more equitable and reconciled educational system that respects and appropriately integrates Indigenous Knowledge, perceptions, and ways of learning where appropriate, contributing to a broader societal healing process in an attempt toward Reconciliation.

Feeling stuck

However, one of the hardest parts of change is knowing where to start. As noted by Sheila Cote-Meek, Associate Vice President of Academic and Indigenous Programs at Laurentian University, in the article by Universities Canada called *Postsecondary Education and Reconciliation:*

> "I hear a desire to bring about change, but often people then get stuck and ask, "What specifically needs to change?" The issue is complex and requires dialogue that is followed up with action. Bringing about deeper systemic, transformative and

> reconciliatory change demands, at a minimum, that four intersecting aspects be considered: addressing the systemic under-representation of Indigenous peoples in the academy; providing sufficient resources to any program or change that is put in place; changing the structure by way of decision-making; and changing the culture of the institution" …
>
> "As a result of the TRC's Calls to Action, we are now witnessing increased attention to curricula at all levels of education. However, increasing Indigenous content and perspectives does not mean simply adding to existing curricula; it requires dialogue and a deep understanding of the history of this country, including the relationship between Indigenous peoples and settler society. I believe that Indigenous faculty must play a critical role in bringing about needed changes to curricula".

Two-Eyed Seeing

Etuaptmumk is the Mi'kmaw word for Two-Eyed Seeing.

"Mi'kmaq Elder Albert Marshall from Eskasoni First Nation in Atlantic Canada uses the phrase "Two-Eyed Seeing" as a guiding principle for collaboration between mainstream and Indigenous Knowledges and ways of knowing. He emphasizes that we need to learn to see from one eye with the strengths (or best) in the Indigenous Knowledges and ways of knowing and learn to see from the other eye with the strengths (or best) in the mainstream … and, most importantly, we need to learn to see with both these eyes together for the benefit of all Peoples and others on Mother Earth" (Bartlett, 2012).

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https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1323#oembed-3

Video credit: Cheryl Bartlett

So, where does this leave us now?

This module intends to respectfully acknowledge the Truth of Canada's history and the education system as related to landscape horticulture. In addition, the module intends to actively contribute to the work of Reconciliation through the lens of *Etuaptmumk* or Two-Eyed Seeing by asking learners to reflect and reconsider the existing curriculum by appropriately and respectfully acknowledging or integrating Indigenous knowledge and ways of knowing into the existing landscape horticulture curriculum (also known as pedagogy).

Ultimately, this module is calling on landscape horticulture instructors across Canada to consider the historical context and immediate need for change by reflecting on their personal beliefs and values and reflecting on how this influences their approach to teaching and learning in the field of landscape horticulture.

Resource Name	Resource Details	Resource Link
SDG Toolkit for Colleges and Institutes Canada	A practical guide to the United Nations Sustainable Development Goals in post-secondary institutions	https://pressbooks.pub/sdgcicanguide/i introduction/
Unesco International Centre for Technical, Vocational Education and Training	This platform aims to provide TVET stakeholders and practitioners with information on free-to-use toolkits that are available online.	https://unevoc.unesco.org/home/ fwd2Toolkits+for+TVET+providers
Truth and Reconciliation Commission of Canada	The Truth and Reconciliation Commission (TRC) provided those directly or indirectly affected by the legacy of the Indian Residential Schools system with an opportunity to share their stories and experiences.	https://www.rcaanc-cirnac.gc.ca/eng/1 1529106060525

Truth and Reconciliation Commission: Calls to Action	In order to redress the legacy of residential schools and advance the process of Canadian reconciliation, the Truth and Reconciliation Commission makes the following calls to action.	https://www2.gov.bc.ca/assets/gov/british-columbians-our-governments/i aboriginal-peoples-documents/calls_to_action_english2.pdf
Indspire: Truth and Reconciliation in Post-Secondary Settings: Student Experience	Indigenous-led research on Indigenous student experience in-post-secondary settings	https://indspire.ca/wp-content/uploads JMGD_003_IND_TR_REPORT_FINAL_
University Affairs: Weaving Indigenous and western knowledge	Article: "How Indigenous researchers and communities are working in partnership with universities and non-Indigenous researchers to shape the future of environmental sciences".	https://universityaffairs.ca/features/fea weaving-indigenous-and-western-knov

Universities Canada:Postsecondary education and reconciliation	Article: Sheila Cote-Meek, associate vice president, academic and Indigenous programs, Laurentian University, and speaker at Universities Canada's Converge 2017.	https://univcan.ca/media-room/media-postsecondary-education-reconciliatio

How this Faculty Training Module (FTM) Can be Used to Enhance Pedagogy and Curriculum

Photo Credit: Martin Bennie from Unsplash

What to Expect

As stated in Pulling Together: A Guide for Curriculum Developers"

> "We all live on Indigenous lands, many of which were never ceded but were stolen by settler governments. Those of us who are settlers are considered to be visitors in the lands of Indigenous Peoples. Out of respect, we must come to know,

> understand, and value Indigenous culture. This means learning about local cultures, languages, and protocols".

Before we dive in, it's important to first note that there are as many perceptions as there are people in this world. Knowing this, it's important to recognize that there is no one way of knowing, seeing, or learning, and this is true for the uniquely diverse Indigenous Peoples across many First Nations throughout a place that some people call Canada and some people call Turtle Island and the many other names for land.

In this faculty training module, you are invited to engage with the story of regenerative landscaping. The story of regenerative landscaping uses the approach of *Etuaptmumk* or Two-Eyed seeing, to figuratively build a landscape.

The regenerative landscape approach intends to enhance the existing curriculum, bridge horticulture education and industry toward a reflective and greener mindset, and employ greener practices. The module is divided into five chapters, which cover the planning, construction (soft and hardscape), and maintenance of a landscape using green thinking, practices, and skills.

Teaching and Learning Examples for Instructors

Yep, the authors are horticulture educators too! The enormous amount of time and energy it takes to (re)design and deliver meaningful learning activities and diverse assessments that align with the required curriculum, student interests, industry expectations, and trending issues was at the forefront when creating this professional development module.

In response, this module was developed to provide relevant examples and materials for horticulture educators (that's you!) to reflect on their teaching philosophy and ease the transition of this content or similar content to enhance curriculum and ultimately student learning.

With that in mind, it is important to note that this module was created as a resource for you to pull from, learn from, or build upon. We hope that you can refer to the content in this module, meaningfully question and consider the content as it relates to yourself and your local context and industry, and practice integrating change into your pedagogy and the curriculum.

Within each chapter and topic, you will find examples and attempts to bridge the topics of climate change and Indigenous Knowledge and perspectives into the existing horticulture curriculum through reflection and various resources.

Here are a few ways that we anticipate this faculty training module can be used:

1. You might explore new information that supports the development of your teaching philosophy through the investigation of your pedagogical and curriculum choices and their impact on student learning.
2. There may be new information on relevant topics such as climate change, Indigenous Knowledge and perspectives, Indigenous principles of learning, and green skills and practices.
3. You may discover new ways to design and present content to learners, including new or authentic voices and perceptions.
4. You may discover new assessment methods or

learning intentions integrated into the content as examples.

Let's dig in!

Photo by Osama Khan on Unsplash

Please join us.

How to Navigate this Faculty Training Module

Photo by Johannes Plenio on Unsplash

Delivery Details

This textbook is structured as a single module consisting of five chapters covering separate but interdependent topics. While it is recommended to follow the lessons consecutively to fully engage with the scaffolding design used for learning, it is not mandatory.

Navigating the Faculty Training Module

This book was designed and optimized to be read online. You can navigate through the book by clicking the **Contents** dropdown on the left-hand menu and selecting a chapter. You

can also navigate by using the **Next** and **Previous** links in the red bar at the bottom of each page.

If you require offline access, you can download this book as a PDF or Epub. On the title page under the cover image, click the **Download** dropdown and choose the format you would like to download.

Self-Reflection Opportunities

As mentioned earlier, this module is centred on the belief that educator's identities and perceptions influence the design and delivery of curriculum. In turn, our teaching methods and curriculum choices become fundamental aspects of what and how we teach. To that end, we encourage you to commit to constantly exploring and experimenting with new approaches to teaching and learning in response to the evolving needs of students and wider society. We recognize that our teaching styles can have a significant impact not only on individual learners but also on creating and shifting the culture of the horticulture industry and wider society as a whole.

With that in mind, there are two self-reflection opportunities included in this module for learners (that's you!) that have been designed to emphasize the importance of your role as a horticulture educator in discussing the impact of landscape horticulture on the environment, guiding students toward greener knowledge and skills, and acknowledging Indigenous Knowledge and perceptions to encourage wider mindsets and skillsets for students.

The *Final* Self-Reflection Opportunity

This module was designed to prepare you to start a conversation in a meaningful and respectful way that encompasses the key topics presented in each chapter. Therefore, the **final** self-reflection opportunity asks you to initiate a conversation and/or design a lesson plan or learning activity utilizing the material and concepts explored throughout the chapters in this module.

These topics include, but are not limited to, *greening*, climate change, Indigenous Knowledge and ways of learning, and the environmental, economic, and societal impacts of landscape horticulture. Through this final self-reflection opportunity, the hope is that you will be able to demonstrate your understanding of the course material and your ability to effectively communicate about these important issues as they relate to the places you live in a way that is meaningful to you.

The *Continuous* Self-Reflection Opportunity

To support you in completing the final self-reflection opportunity, the **continuous** reflection asks you to record your reflections in a personal journal throughout the chapters. This journal may contain words, concepts, sketches, or images that resonate with you as you progress through the module. The objective of this journal is to help you identify, describe, and interpret your thoughts and understanding of the key topics covered in the module and to develop the ideas and language needed to initiate a conversation and/or learning activity.

Each chapter will provide guiding questions and examples to prompt your reflective writing or sketching and help you track the progression of your thinking and perceptions as they may

change throughout the module. By keeping a reflective journal, you may gain a deeper understanding of the material and be better prepared to engage in meaningful conversations and/or learning activities about the key topics covered in the course.

Supply List

- The digital reflection booklet is available here (you can print it if preferred):
    - Link to Reflection Booklet: click this blue hyper-link.
- Journal, notepad or digital tool to record your thoughts
- Pen/pencil

This module has been designed with the hope of providing a comfortable and flexible learning environment that caters to your individual learning needs. You can complete the module at your desk or on your mobile phone. However, we encourage you to engage with the content and reflective questions while surrounded by nature whenever possible. If you are anything like us (a total plant nerd), this won't be hard for you.

Being immersed in nature has been proven to enhance the learning experience and help you develop a deeper understanding of the relationship between humans and the environment. But you probably already knew that! Whether you choose to learn indoors or outdoors, we hope you feel comfortable and supported throughout the module.

Whenever possible, we encourage you to consider the content and questions presented referring to *Etuaptmumk* or Two-Eyed Seeing as a guiding principle.

Let's practice a self-reflection opportunity!

Here's an example of what the guiding questions look like:

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. What is your current perception of *greening*, climate change, Indigenization, or decolonization?
2. How are you currently situating yourself within the conversation of *greening*, climate change, Indigenization, or decolonization?
3. In what ways do you expect or want this faculty training module to support or help you develop your personal teaching philosophy?
4. We invite you to write 5–10 sentences or make a sketch of your favourite landscape. Can you describe or draw what you enjoy the most about this landscape? What are the design and installation features that inspire you? How do you

feel in this landscape?

PART I

Chapter 1: Planning with Purpose

Chapter 1: Planning with Purpose

Photo by StockSnap on Pixabay

Learning Intentions

By the end of this chapter, you may be able to …

- Reflect on your personal experiences and perceptions of climate change, Indigenous ways of knowing, and regenerative landscaping, and explain how they influence your curriculum choices and the skills or practices used in the horticulture industry.
- Describe the characteristics of climate change,

Indigenous ways of learning, and regenerative landscaping, and explain your view on how they are interconnected.

- Communicate your perspectives on climate change, Indigenous ways of learning, and regenerative landscaping.

Introduction

Welcome to Chapter 1: Planning with Purpose. As you know, the horticulture industry is significantly impacted by the consequences of climate change, including changes in temperature, precipitation, and extreme weather events. This, in turn, can influence the design, construction, and maintenance of exterior landscapes. Let's take a look at some examples of how landscape horticulture is forced to adapt due to climate change.

1. **Changes in Temperature:** Rising temperatures can affect the design of outdoor spaces, as they may become too hot and uncomfortable for people to use. Temperature changes can also impact the types of plants and materials used in landscaping, as well as the design of shading structures such as pergolas or shade sails. In addition, heat stress can cause damage to outdoor furniture, hardscaping materials, and other outdoor features. Landscape horticulture professionals can adapt to these changes by selecting and procuring local materials and plants that are more heat-tolerant or by incorporating water features or misting systems to provide relief from the heat.

2. **Changes in Precipitation**: Changes in precipitation patterns can impact the design and maintenance of outdoor spaces. Drought conditions can lead to reduced water availability for plants and can impact the stability of hardscaping materials such as retaining walls and paved surfaces. Heavy rainfall events, such as atmospheric rivers, can cause erosion and flooding, which can damage landscaping and infrastructure. Landscape horticulturists can adapt to these changes by incorporating permeable materials to allow for better water infiltration, designing rain gardens or bioswales to capture and absorb excess water, and selecting more drought-tolerant plant species.
3. **Extreme Weather Events**: Extreme weather events such as hurricanes, snowstorms, tornadoes, and hailstorms outside of regular storm seasons can cause significant damage to outdoor spaces and infrastructure. Landscape horticulturists can take steps to mitigate the impact of these events by incorporating wind-resistant plant species, selecting materials that can withstand extreme weather conditions, and designing landscape features such as berms, retaining walls, or building soil to protect from flooding and erosion.
4. **Energy Efficiency**: Climate change is driving increased demand for energy-efficient outdoor lighting and heating systems and equipment. Landscape horticulturists can help clients reduce their carbon footprint by incorporating LED lighting, solar-powered lighting, and energy-efficient heating systems into their outdoor spaces. They can

> also use battery-powered equipment to complete regular maintenance and construction tasks.

The horticulture industry is closely tied to the natural environment; in fact, we work in the natural environment every day and observe and feel the impacts of climate change every day. To be honest, our love for the natural environment is probably one of the reasons that we built our careers in horticulture.

However, the truth remains that climate change has a significant impact on the design, construction, and maintenance practices that landscape horticulturalists choose. In turn, the landscape construction and maintenance practices chosen by landscape horticulturalists can contribute to further climate change consequences through the selection of supplies, equipment, and practices or work towards mitigation of the impacts of climate change.

In support of contributing to *greening* and sustainable environmental, economic, and social ecosystems, this chapter introduces key topics such as climate change, Indigenous ways of knowing, and the first stages of planning a regenerative landscape.

As you progress through this module, you will have access to information in various formats, such as writing, videos, infographics, and activities. We recommend that you choose the materials that best support your learning of the key topics presented in this chapter.

Climate Change

Photo by (United Nations, n.d.)

Keywords: climate change, conversation, greenhouse gas emissions, CO2, global warming, ask, listen, reflect, agree, share, future-proofing.

What is Climate Change?

According to the United Nations, "climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels

like coal, oil and gas. Burning fossil fuels generates greenhouse gas emissions that act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures…There are seven gases classified under GHGs: Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs), Sulfur hexafluoride (SF6), Nitrogen trifluoride (NF3). Among these gases, carbon dioxide and methane are the largest contributors …

These come from fossil fuel combustion, eg., using gasoline to drive a car or coal to heat a building. Clearing land and forests can also release carbon dioxide. Landfills for garbage are a major source of methane emissions. Energy, industry, transport, buildings, agriculture, and land use are among the main emitters." (United Nations, n.d.).

In addition, the Nature Conservancy of Canada states that "climate change is a major threat to wildlife and ecosystems in Canada and around the world. Limiting the amount of warming and adapting to the negative impacts of climate change are critical, not only to protect biodiversity but also to support human health and well-being" (Nature Conservancy Canada, n.d.).

But what's the difference between climate change and global warming? The David Suzuki Foundation states that "although the terms "climate change" and "global warming" are often used interchangeably, some experts note a difference: global warming is the overall phenomenon whereby global average temperatures are slowly increasing. Climate change is the result of global warming. That is, as global temperatures increase, climatic conditions change in various ways" (David Suzuki Foundation, 2023).

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"Everyone's talking about climate change but what is our climate? And why is it changing? Our climate has been changing much faster and there are many ways you and I can make a difference". (Environment and Climate Change Canada, 2021).
Video credit: What is Climate Change? (Environment and Climate Change Canada, 2021)

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"This video is a short, sweet, and pragmatic summary of climate change – what the problem is, why, and what you can actually do about it". (Kniberg, 2017).
Video credit: Friendly Guide to Climate Change – and what you can do to help #everytoncounts (Kniberg, 2017)

How to Talk about Climate Change

So, we know that climate change is an ongoing phenomenon, and it is primarily caused by the decisions humans make. This includes the choices we make regarding horticulture practices used in landscape construction and maintenance. The first step in facing the challenging consequences of climate change is to inform ourselves and select adaptive and mitigative strategies to apply in our daily horticulture work—and that starts here, with you! Another essential task is communicating *greener* and more sustainable landscape construction and maintenance practices to students and clients.

So, how can we navigate through challenging conversations about climate change and bring the reality of climate change into classrooms? Equally important, how can we prepare students for conversations with employers, suppliers, or customers about the impacts of climate change?

The David Sukui Foundation recommends nine (9) essential resources for climate change conversations. This module includes two examples from the David Suzuki Foundation's resources on how to talk about climate change; however, a full list of resources on how and why to talk about climate change can be found by clicking on this blue link.

Climate Change Conversation Resource: Conversation Cheat Sheet

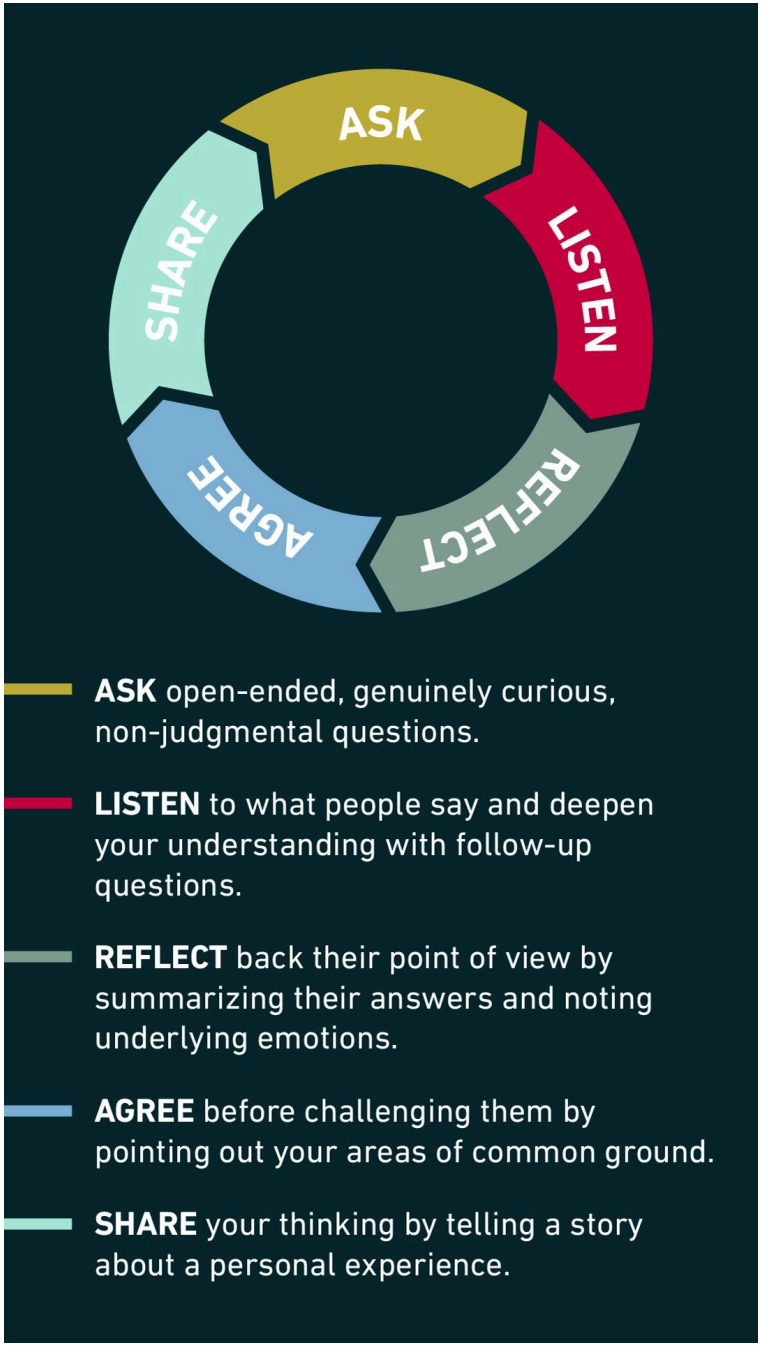
ASK
LISTEN
REFLECT
AGREE
SHARE
ASK open-ended, genuinely curious, non-judgmental questions.
LISTEN to what people say and deepen your understanding with follow-up questions.
REFLECT back their point of view by summarizing their answers and noting underlying emotions.
AGREE before challenging them by pointing out your areas of common ground.
SHARE your thinking by telling a story about a personal experience.

Photo by Karin Tamerius.

"This five-step conversation cycle was developed by Karin Tamerius of Smart Politics. Drawing on expertise in social and political psychology and extensive experience with online dialogues, she developed this conversation technique to help people have difficult conversations. This cheat sheet gives you a summary of each of the five steps in a handy graphic that you can save to your phone for when you need it" (David Suzuki Foundation, 2023).

Climate Change Conversation Resource: How to Turn Climate Anxiety into Action

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https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=5#oembed-3

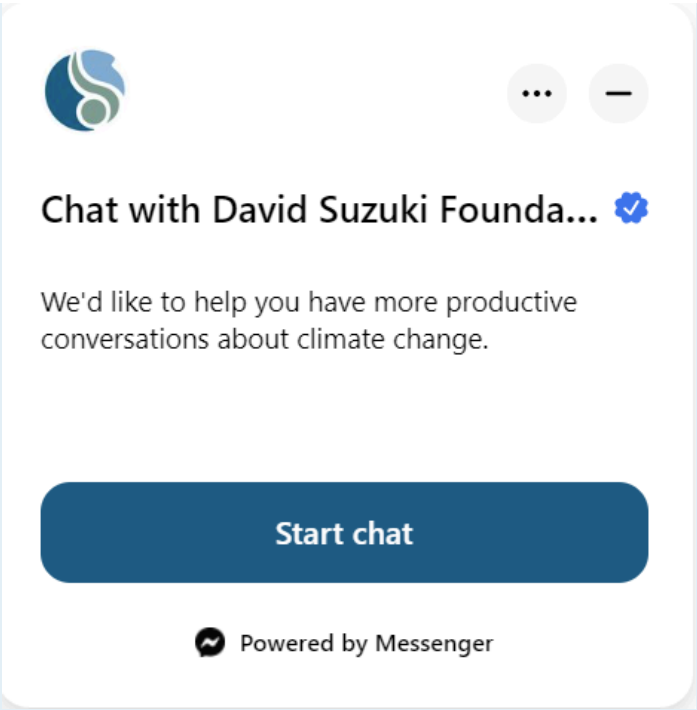
"It's normal to feel anxious or overwhelmed by climate change, says psychologist Renée Lertzman. Can we turn those feelings into something productive? In an affirming talk, Lertzman discusses the emotional effects of climate change and offers insights on how psychology can help us discover both the creativity and resilience needed to act on environmental issues". (TEDWomen, 2019).
Video credit: How to turn climate anxiety into action

(TEDWomen, 2019).

Teaching and Learning Examples for Instructors

Use a flipped classroom teaching strategy and ask students to prepare for an in-person climate conversation by first using an online resource in advance of class, such as the David Suzuki Foundations CliMate bot. Then, during in-person class, briefly review the topic of climate change and ask students to volunteer to roleplay as stakeholders in a climate conversation involving a landscape construction or maintenance project.

"Introducing CliMate, your climate conversation coach



This fun, simple chatbot on Facebook Messenger will teach you how to stop arguing and start understanding people. In a guided practice conversation, you'll get to choose responses from a set of options, and CliMate will provide insight into the reaction your responses might elicit.

We know that conversations about climate change can bring up all sorts of emotions, like frustration, despair, anger, and embarrassment. CliMate will help you cultivate empathy and keep your conversations productive. It's also sure to make you chuckle, especially if you've tried having these sorts of conversations already.

This isn't about winning an argument; it's about learning

to have productive conversations based on common ground and shared values. CliMate is rooted in science. The approach is based on the work of Karin Tamerius of Smart Politics. Drawing on expertise in social and political psychology and extensive experience with online dialogues, she developed a five-step method to help people have difficult conversations. While CliMate will help you have less polarized conversations about climate change, it can also be useful for any potentially divisive conversation topics". (David Suzuki Foundation, 2023).

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. How do human activities contribute to the release of greenhouse gases into the atmosphere, and what are some ways that we can reduce our carbon footprint and mitigate the impacts of climate

change?

2. Describe your personal views of climate change and explain the ways that your actions contribute to climate change or aim to reduce the impact of climate change.
3. What strategies can be effective in communicating about climate change with individuals who may have different perspectives or levels of knowledge on the issue?

Indigenous Knowledge, Perspectives, and Learning

Keywords: Indigenous, respectful, meaningful, diverse, awareness, systematic change, decolonize.

We begin this section of Chapter 1: Planning with Purpose with an excerpt from a collaborative project led by BCcampus on behalf of the Ministry of Advanced Education that aims to facilitate a system-wide Indigenization of Curriculum and Cultural Awareness training project (ICCAT) for post-secondary institutions across British Columbia (2016).

"There is a systemic change occurring across post-secondary institutions through processes and practices that support Indigenization, decolonization, and reconciliation. A guiding principle from the Truth and Reconciliation Commission of Canada process states why this change is happening. Reconciliation requires constructive action on addressing the ongoing legacies of colonialism that have had destructive impacts on Aboriginal peoples' education, cultures and languages, health, child welfare, the administration of justice, and economic opportunities and prosperity (2015, p. 3).

We all have a role to play. As noted by Universities Canada, "higher education offers great potential for reconciliation and a renewed relationship between Indigenous and non-Indigenous people in Canada." (2015) Similarly, Colleges and Institutions Canada states that "Indigenous education will strengthen

colleges' and institutes' contribution to improving the lives of learners and communities." (2015).

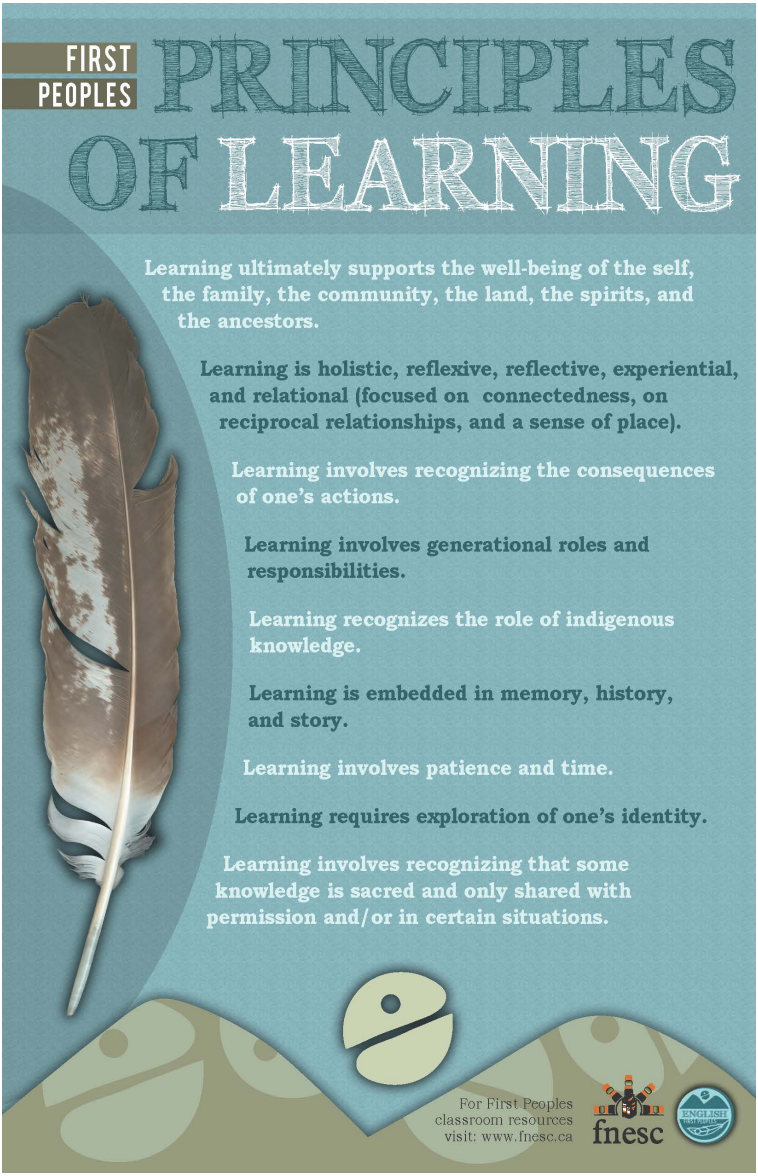
As informed educators, we know that our pedagogical choices, curriculum design, and delivery decisions have an impact on how and what students learn. It's through this lens of interconnectedness that we encourage you to engage with the following resources—and do your own research—and ask yourself if you should and how you might appropriately and respectfully acknowledge Indigenous Knowledge in curriculum design and delivery, and to hold space for Indigenous wisdom and ways of learning to share and shape student learning.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1110#oembed-1

"Jo-ann Archibald, Professor and the director of NITEP (Native Indian Teacher Education Program) at the Department of Educational Studies (EDST), as well as the associate dean for Indigenous Education at the Faculty of Education at UBC, talks about what 'Indigenizing the curriculum' means and how it can be practiced" (UBC Educational Studies, 2012).
Video credit: Interview with Dr. Jo-ann Archibald (UBC Educational Students, 2012)

As mentioned before, this faculty training module attempts to respectfully acknowledge and incorporate the First People's Principles of Learning where appropriate. These principles, informed by Indigenous Knowledge and perspectives, were carefully chosen with the intention of creating a culturally responsive and inclusive module and learning environment. The First Peoples Principles of Learning are shown in the poster below.

The First Peoples Principles of Learning were articulated by Indigenous Elders, scholars, and knowledge keepers to guide the development of the curriculum and teaching of the English First Peoples course created by the BC Ministry of Education and First Nations Education Steering Committee in 2006/2007″ (First Nations Education Steering Committee, n.d).



Poster credit: First Nations Education Steering Committee, n.d

Justice Institute of British Columbia: Some Ways to Indigenize and Decolonize Curriculum

- acknowledge traditional territories of First Peoples using a variety of mediums (in lectures, course outlines and web-based course architecture, e.g. Blackboard)
- work with Elders and Knowledge Keepers to infuse cultures into the curriculum
- understand Indigenous worldviews and the distinction and diversity of Indigenous People by language, culture and region
- include Indigenous perspectives and learn about and use Indigenous pedagogical approaches
- visit Indigenous communities for field trips, events, and feasts
- incorporate talking circles to facilitate communication (circle methodology)
- respect and recognize rights for distinctive Indigenous customs, spirituality, traditions and practices
- use Indigenous Principles of Learning, such as experiential and lifelong learning approaches
- use the oral tradition, telling stories with guest speakers such as Elders, Knowledge Keepers and community leaders
- use Indigenous research methodologies
- use Indigenous-authored texts, articles and books
- use Indigenous film
- hire Indigenous instructors

Teaching and Learning Examples for Instructors

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1110#oembed-2

"As climate chaos increases around the world, Michelle Week, a farmer outside of Portland, Oregon is drawing on her Sinixt indigenous knowledge to adapt her farm to the changing seasons. By practicing techniques like seed saving and dry farming, Michelle is combating the increasing food security crisis while continuing to provide fresh food to her local community (PBS Terra, 2023).
Video credit: How This Indigenous Farmer Is Solving Food Insecurity (PBS Terra, 2023)

One or more interactive elements has been excluded from this version of the text. You can view them online here:

https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1110#oembed-3

"The Aboriginal Mother Centre Society is growing a garden of plants with ties to Indigenous culture and customs. It features plants for food and medicinal use. They say they hope the space can provide urban Indigenous families with nourishment and comfort" (CBC Vancouver, 2022).

Video credit: Cultivating Indigenous Plants (CBC Vancouver, 2021)

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1110#oembed-4

This video is one example of how to honour Indigenous knowledge in horticulture education. The presenters begin in a good way by acknowledging the First Nation and Peoples on whose land they are, before sharing the native and non-native plants growing in the Justice Institute of British Columbia

Garden.
Video Credit: Introduction to JIBC's Indigenous Garden (Justice Institute of British Columbia, 2020)

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. What are your current perceptions of Indigenous knowledge, learning, and ways of knowing? In what ways have your perceptions changed since engaging with the material in this module?
2. Recognizing that Indigenization and decolonization are a continual process, in what ways or what resources will you use to explore how to Indigenize or decolonize your curriculum?
3. Consider using the Your Identity Map Resource.

Your identity map

"There is a strong link between culture and the way people think and learn, so an understanding of the culture of a learner is essential in maximizing learning potential. Understanding the way your own culture influences your ways of learning will help you to understand the importance of this for your students as well, Indigenous and non-Indigenous. These questions offer an opportunity to reflect on your own unique cultural standpoint, no matter where you are from in this world. These questions were developed by Rhonda Ashby in New South Wales, Australia, inspired by the work of Dr. Karen Martin, a Noonuccal woman and Aboriginal researcher. The questions will help you reflect on your ways of being, ways of knowing, ways of doing, and ways of valuing. In Western knowledge systems, these become ontology, epistemology, methodology, and axiology. You can add or remove any questions and use the worksheet as you wish, including with your students. Note: Questioning, challenging, and resisting this document is a valid way of engaging with it. Just make sure you're not doing this as a way to avoid self-reflection or self-scrutiny…" (p.1)

Regenerative Landscape: Planning with Purpose

Regerate (to renew/restore/respect)

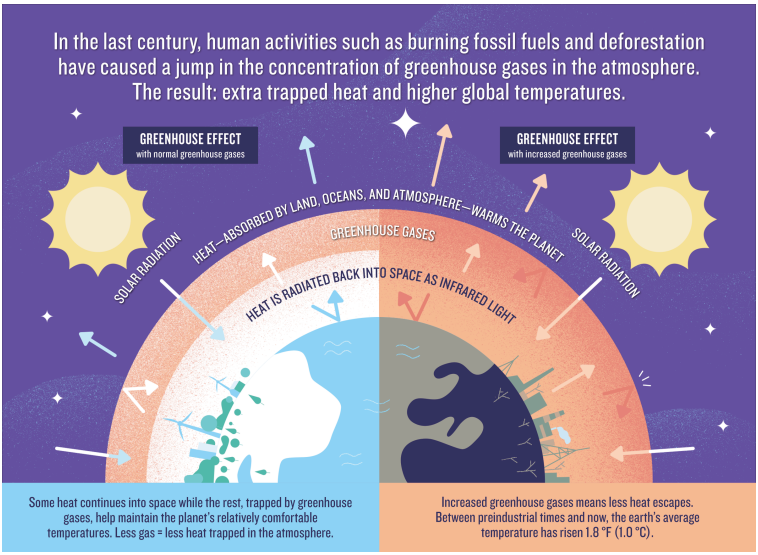
Keywords: greenhouse gas effect, carbon footprint, carbon sequestration, regenerative landscape, food security, wildlife habitat, biodiversity, natural resources, social impact, reflection

Let's start by circling back to the greenhouse effect. The greenhouse effect is a natural phenomenon that occurs when certain gases in the Earth's atmosphere, known as greenhouse gases, trap and absorb heat from the sun that is radiated back into space. This process helps regulate the earth's temperature, making it habitable for life.

Greenhouse gases, such as carbon dioxide, methane, and water vapour, act like a blanket around the Earth, trapping the sun's energy and preventing it from escaping into space. This causes the Earth's atmosphere to warm, which in turn warms the planet's surface and oceans. While the greenhouse effect is a natural process, human activities such as burning fossil fuels and deforestation have increased the number of greenhouse gases in the atmosphere, leading to an enhanced greenhouse effect and global warming. This has serious implications for the earth's climate, including rising sea levels, more frequent and intense heat waves, droughts, and extreme weather events.

So, we know that the biggest cause of climate change is ***humans,*** and it's also our responsibility within the landscape

horticulture industry to *green* our mindset and select alternative practices to adapt to and mitigate the consequences of climate change.



(Natural Resources Defence Council, n.d.)

We invite you to recall the overview sections on Indigenous Knowledge, perspectives, and learning, in particular the First People's Principles of Learning, and Two-eyed Seeing.

We encourage you to identify ways that the regenerative landscape aims to connect the elements of the First People's Principles of Learning and Two-Eyed Seeing into the planning phase of the regenerative landscape.

The Regenerative Landscape: Introduction

Regenerate: (to renew/restore/respect)

Embedded in the essence of the horticulture industry,

commonly referred to as landscaping, is the word 'land'. Land is an important place for us to start our conversation, as it's central to the cultural and historical past of the once Nations and current Canada.

In other words, by looking back and acknowledging the Truth of what happened on the lands and to the Aboriginal Peoples who stewarded these lands for thousands of years, we can begin to look towards ways to appropriately acknowledge Indigenous Knowledge, perspectives, and learning and contribute toward Reconciliation efforts relevant to post-secondary education and the horticulture industry.

Land Governance: Past

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1114#oembed-1

Video Credit: David Suzuki Foundation, 2024

Land Governance: Present

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/

facultytrainingmodulesforgreeningthelandscapetrade/?p=1114#oembed-2

Video Credit: David Suzuki Foundation, 2024

Land Governance: Future

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1114#oembed-3

Video Credit: David Suzuki Foundation, 2024

https://fpcc.ca/stories/first-peoples-map/

To support your understanding of the land, we encourage you to learn about the land you reside on. "This interactive online map provides information about the Indigenous languages, cultures, and places of British Columbia. The map can be used to view language regions, First Nations place names, search for community landmarks, listen to audio pronunciations of places, languages, greetings, and more.".
Credit: (First Peoples' Cultural Council, 2024)

The Regenerative Landscape: A Wider Look

To begin the story of the regenerative landscape, we would like to acknowledge that the design and development of the regenerative landscape took place on the traditional and unceded lands of the Snuneymuxw First Nation where the residents of this landscape gratefully live and work as uninvited guests and intend to walk softly.

Before we get into the details of the regenerative landscape base plan, we invite you to look at the positionality of the regenerative landscape in relation to the wider ecosystem and community. Below are images to help orient you to the location of the regenerative landscape.

By first using a wider lens to recognize the regenerative landscape, the aim is to become aware of the environmental and community systems that the regenerative landscape connects to, contributes to, and disrupts.

The Regenerative Landscape: A closer look

Now that we know how the regenerative landscape is situated within the broader ecosystem and community, let's take a closer look at the regenerative landscape base plan.

As we consider the planning phase, it's important to acknowledge the surrounding area. To the southwest, there is a rocky knoll that collects and directs water toward the forested parkland to the north of the landscape. This forested parkland serves as a habitat corridor, connecting the plant and animal species in the suburban areas to a larger urban park located to the northwest of the landscape.

These observations emphasize the significance of the regenerative landscape's location and the impact that the construction and maintenance phases will have on the waterways, plants, animals, and nearby residents.

The Regenerative Landscape: Design

Regenerative landscaping is a holistic approach that promotes environmental, social, and economic sustainability (review the United Nations SDGs here). The regenerative landscape refers to a system of landscape design, construction, and maintenance that aims to renew, restore, respect, and improve the health of ecosystems as a whole (review Two-eyed Seeing here).

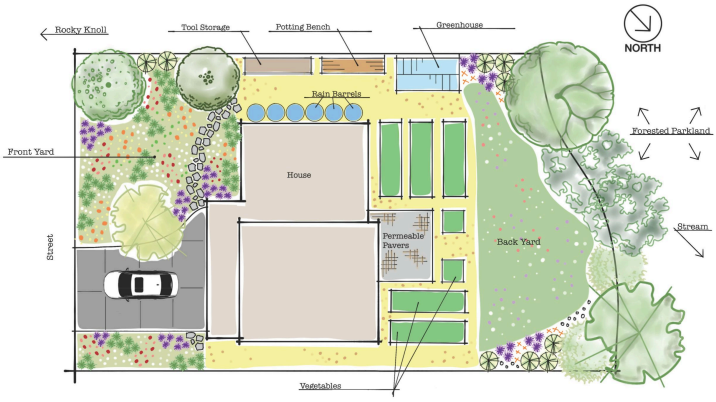
The regenerative landscape approach involves using natural systems and processes to **enhance soil health**, **promote biodiversity**, **increase carbon sequestration**, and create ***greener***, **sustainable**, **resilient landscapes for people, animals, and plants**.

A major element of the regenerative landscape is to highlight the reciprocal, interdependent, and cyclical relationship between landscape horticulturalists, the surrounding environment, and the wider ecosystem. For example, the surrounding environment is a place where landscape horticulturalists have a canvas to construct their work, and in turn, landscape horticulturalists *must give* back to the ecosystem through their work.

The regenerative landscape is introduced and used in this faculty training module as an example of how horticulturalists in landscape construction and maintenance can adapt their practices and reduce waste and greenhouse gas emissions, which are the main contributors to global warming, while respectfully interacting with the living environments and traditional lands on which they work.

In each chapter of the module, a section of the regenerative landscape is *figuratively* built to illustrate ways to reduce the carbon footprint through the reflective and thoughtful selection of *greener* and sustainable landscape construction and maintenance practices. *A carbon footprint is the total amount of greenhouse gases (including carbon dioxide and methane) that are generated by our actions.

The goal of the regenerative landscape is to promote reflection, create self-sustaining landscapes, and provide a range of ecosystem services, such as **clean air and water**, **pollination**, **resource rejuvenation**, and **wildlife habitat**. In addition to environmental benefits, regenerative landscapes can also provide economic and social benefits, such as **improved food security, reduced energy use,** and **enhanced community resilience**.



The Regenerative Landscape Plan.

Key Features of the Regenerative Landscape Plan

Plan Area	Regenerative Feature	Regenerative Benefit
Front Garden	Significant plant material: trees, meadow planting, drought-tolerant plants, native plants, edible or medicinal plants	Promote biodiversity and wildlife habitat, increase carbon sequestration, improve air quality, reduce erosion, water conservation, ecosystem resiliency
Back Garden	Reduced lawn, increased plant material, native plant border, vegetable beds, permeable pavers.	Enhance soil health, increase food security, enhance community resistance, resource rejuvenation, and clean air and water. Small lawn area for the (adorable) family dog, a health and wellness feature for the residents.

General	Rain barrels, greenhouse, battery-powered maintenance equipment /solar energy	Reduce carbon emissions, food security, water collection and rejuvenation into waterways, and hydrological management with increased plant material to filter and slow the return of stormwater drainage into the waterways

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. How can regenerative landscaping be used to achieve the environmental, economic, and social goals of *greener* and more sustainable development?
2. What is the relationship between regenerative landscaping and the UN Sustainable Development Goals (SDGs), and how can individuals contribute to this approach in the planning and designing phases of a landscape project?
3. Consider your past, the past of the land, and the traditional peoples who stewarded the land for thousands of years before. What comes to mind through reflection on these factors?
4. What are your thoughts on Landback? In what

ways do you perceive land back and its connection to the horticulture industry?

5. Imagine or draw your favourite garden that you recalled at the beginning of this chapter. Do your favourite features in your garden align with the goals of the regenerative landscape? If yes, how? If not, explain how they differ.
6. In what ways do you feel connected to your projects, and what influence do you feel you have on the environment through your work?
7. Think of your upcoming landscape design project. How can the principles of regenerative landscaping be applied to the design and management of your next project, and what are the potential benefits of aligning your garden with these goals?

Additional Resources

We've compiled a list of additional resources to support your learning about the topics in this chapter. The additional resources are not required as part of this course; please engage with them as you need them to support your learning.

Name	Link
David Suzuki Foundation: What is Land Back?	https://davidsuzuki.org/what-you-can-do/what-is-land-back/
4 Rs Youth Movement: LAND BACK! What do we mean?	https://4rsyouth.ca/land-back-what-do-we-mean/
CBC: Here are 3 places to watch the Land Back movement unfold in 2023	https://www.cbc.ca/radio/unreserved/indigenous-land-back-movement-1.6704611

PART II

Chapter 2: Design for Biodiversity

Chapter 2: Design for Biodiversity

Photo by James Wheeler on Unsplash

Learning Intentions

By the end of this chapter, you may be able to …

- Recognize contemporary approaches in landscape construction and maintenance that enhance biodiversity.
- Explain the concept of biodiversity and assess how landscape construction and maintenance practices

can impact the environment.

- Analyze the advantages of planting biodiverse landscapes as a means of fostering ecosystem health and promoting environmental, economic, and social sustainability.

Let's Review

Let's begin with a review of Chapter 1: Planning with Purpose. In Chapter 1, our key topics were climate change, Indigenous Knowledge and perceptions, and the regenerative landscape. We looked at the role of humans in the production of CO2, methane, and other harmful emissions (greenhouse gases) through burning fossil fuels and the release of carbon through practices such as deforestation and urbanization.

While it is a natural process that helps regulate the earth's temperature, making it habitable for humans, plants, and animals, the greenhouse effect is amplified by the increase in greenhouse gas concentrations being released into the atmosphere. In other words, the increased greenhouse gas concentration in the atmosphere traps heat and has resulted in a warming planet.

Due to global warming, there are significant consequences that we refer to as climate change. Climate change refers to the long-term alteration of global temperatures, precipitation patterns, and sea levels. In addition, the consequences of climate change include more frequent and severe heat waves, droughts, floods, wildfires, and hurricanes, as well as the loss of ecosystems and biodiversity. Climate change is one of the most pressing environmental and societal issues facing the world today, with significant implications for public health, food security, and economic development.

We also heard authentic voices and viewed resources to explore the appropriateness of holding space for Indigenous Knowledge and perceptions in the landscape horticulture curriculum. We also reflected on the importance and relevance of the First Peoples' Principles of Learning to support learners with diverse backgrounds, and you explored the principles of Two-eyed Seeing through the story of regenerative landscape design.

To conclude Chapter 1, the reflection guiding questions asked you to reflect on how your choices to use certain practices in landscape horticulture may influence the environment, economy, and wider society. If you didn't have a chance, we highly recommend that you consider using the "Your Identify Map Resource" to investigate "the strong link between culture and the way people think and learn" (p.1).

Chapter 2: Introduction

Welcome to Chapter 2: Designing for Biodiversity. In this chapter, we will introduce how biodiversity in landscape horticulture refers to the incorporation of diverse plant and animal species in outdoor spaces such as gardens, parks, and natural areas. This approach to landscaping aims to create a *greener, more* sustainable, and more resilient environment that supports the coexistence of multiple species and promotes ecosystem health.

By incorporating biodiversity into landscaping, we can create habitats that provide **food**, **shelter**, and **nesting sites** for wildlife, as well as improve **soil quality**, **air** and **water filtration**, and overall **environmental health**.

Looking at landscaping through the lens of biodiversity, horticulturalists can create welcoming and aesthetically-

pleasing spacing that serves not only the human species but plants and animal species as well.

Biodiversity

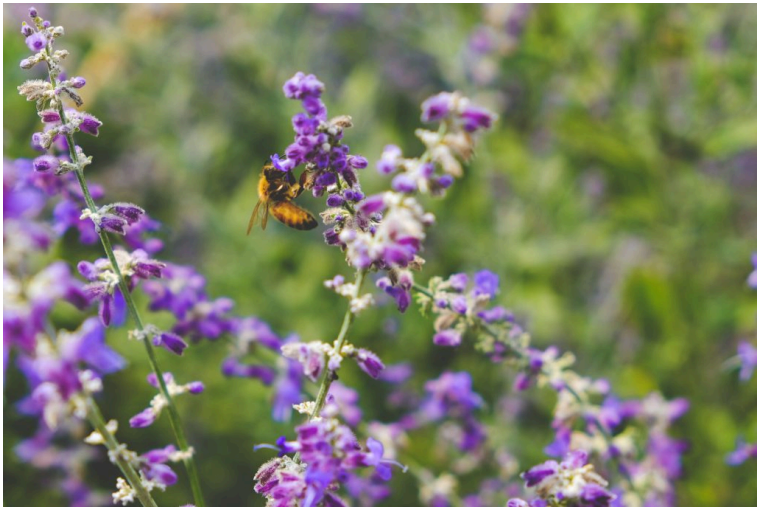


Photo by Scotty Turner on Unsplash

Keywords: biodiversity, ecosystem, habitat, relationship, reciprocal

"Biodiversity (short for "biological diversity") refers to the number, variety, and variability of all living things. Biodiversity is the variety of life in an area, which can range from life in a pool of water that collects between the leaves of a plant to the all-encompassing biosphere. There are many levels of organization that identify biodiversity. These include the genetic diversity of populations, the number and types of species, the distribution and abundance of species in

communities and ecosystems, and the interactions between organisms and their physical environment.

In the last several years, major flooding, extreme weather, and wildfires have propelled climate change into the mainstream. But despite our increased awareness of environmental issues, the vitally important topic of biodiversity loss has received comparatively little attention. Biodiversity is the incredible variety of organisms on our planet, including the diversity between individuals, species, and ecosystems. Biodiversity provides humans with so many invaluable services, such as clean water, medicines, abundant food, and shelter.

Loss of habitat is one of the major factors leading to the loss of biodiversity in BC and worldwide. As human populations continue to increase around the globe, so does the amount of urbanization and, subsequently, the loss of habitat and biodiversity. Urban development has been shown to produce some of the greatest extinction rates worldwide.

Urban development separates natural habitat into numerous, small patches surrounded by human-altered landscapes like cement, grass, crops, and other degraded land types. These small greenspaces often lack native species, which are important for supporting local biodiversity. Instead, they are dominated by exotic species and highly manicured vegetation used for aesthetic purposes. Urban-gradient studies have found that with many species of plants, birds, and butterflies, the number of non-native species increases toward centers of urbanization while the number of native species decreases. In fact, the flora and fauna of cities, even across vastly different parts of the world, are incredibly similar, irrespective of geography or climate" (Nature Trust British Columbia, 2022).

Why is Biodiversity so Important?

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1214#oembed-1

"The food we eat, the air we breathe, our climate—everything that makes Earth inhabitable—all depends on the interplay of billions of species around the world. This is biodiversity. And unfortunately, it is rapidly declining. But it's not too late. We're at a pivotal moment when we can still reverse the loss of nature—for the sake of all life on Earth".
Video credit: Why is Biodiversity so Important? (The Nature Conservancy, 2021)

Teaching and Learning Examples for Instructors

In this lesson, students examine the local territory by observing what is growing and assessing what should be growing to encourage pollinators.
Lesson Plan: Planting with Purpose
Resources

- Habitat Gardens – pollinators template [PowerPoint]
- Working with Elders [PDF]
- Territory Acknowledgements [PDF]
- Medicine Walk [3-minute Video]

Designing for Biodiversity

"Nature-based solutions are one of the most powerful tools we have to mitigate and adapt to climate change, while at the same time, these solutions can provide benefits for biodiversity. For example, large amounts of carbon dioxide are stored in the soil and plant life of forests, wetlands, grasslands and in oceans. Conserving these carbon-rich ecosystems allows carbon to be absorbed and prevents carbon from releasing into the atmosphere, while simultaneously supporting biodiversity" (Government of Canada, 2023).

"In the life of a forest, we are here for a very short time" (Habitat Acquisition Trust, 2022). So, how can landscape horticulturalists connect with nature, develop a relationship with the *land they are on* and acknowledge their role in changing the environment through construction activities? The next videos are an example of people who have been inspired and feel connected to spaces and places and developed a relationship with the environments that they contribute to and disrupt.

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https://pressbooks.bccampus.ca/

facultytrainingmodulesforgreeningthelandscapetrade/?p=1216#oembed-1

"What is the connection between nature and art? How do you find inspiration in your surroundings? Join Australian Indigenous artist Grant Malony as he explores rainforests, ocean and wildlife in his search for inspiration in British Columbia. While exploring the Pacific rainforests with Mike Willie (T'łalis) of the Kwikwasut'inuxw Haxwa'mis First Nation, and Sea Wolf Adventures owner, Grant Malony spots deer in the wild, and photographs a variety of trees covered in moss and plants. The rainforests living Canada's west coast are filled with ancient trees stretching well above the ground, providing visitors an opportunity to connect with the land" (Canada Explore, 2019).

Video credit: Finding Inspiration in the Rainforests of British Columbia, Canada, (Canada Explore, 2019)

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1216#oembed-2

"This virtual short film screening & discussion offered an opportunity for attendees to watch and learn about some

of the habitat stewardship projects landowners in the community are working on, while connecting with these amazing individuals … Property owners have many questions about how to find a balanced approach working on the land (in harmony) with nature, rather than against it. From gardening to tree care, invasive species removal to wildlife monitoring, the Good Neighbours Program provides landowners with the tools to be habitat stewards of natural ecosystems around them. Each year, HAT meets with the landowners in a particular community, watershed, or neighbourhood to discuss habitat stewardship options. This short film features four inspirational stories of landowners on their journey through stewardship, and what they discovered along the way" (Habitat Aquisition Trust, 2022)

Video credit: Being a Good Neighbour to Nature, (Habitat Acquisition Trust, 2022)

Teaching and Learning Examples for Instructors

Title: My Favourite Plant | **Objective**: To encourage participants to share their favourite plants and the family connections they have with them | **Purpose: to** build a community of learners centred around family connections and plants.

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. What does biodiversity mean to you, and how do you incorporate biodiverse practices into your work?
2. What role do you feel you have in changing the landscape, and how can you promote biodiversity and restore and rejuvenate the ecosystem and environmental health?
3. How can you be a good neighbour to your ecosystem in your role as a Horticulturalist?

Regenerative Landscape: Designing for Biodiversity

Keywords: biodiversity, wildlife habitat, Indigenous (*native*), pollinators, community resistance, interconnected, interdependent

As we continue the story of the regenerative landscape, we now shift our focus to promoting biodiversity, creating wildlife habitats, supporting pollinators, and enhancing community resilience during the construction phase. This chapter explores the front garden, which deviates from traditional lawn installations and instead features meadow planting that showcases *greener* and sustainable practices and the use of plants endemic to the region that the regenerative landscape is situated in.

This chapter also showcases the back garden, where a non-traditional lawn was installed with the addition of alternative lawn mixes and bulbs. It's worth noting that several landscape horticulture activities impact biodiversity and ecosystem health, ranging from least (pavement) to most (complete ecological restoration of a site) environmentally sustainable. In the regenerative landscape, you will find a range of horticultural activities that impact the landscape in various ways.

Fragmented Ecosystems

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1218#oembed-1

"Garry oak meadows are home to some of the highest concentrations of species at risk in Canada. Gnarly, sprawling oak trees that frame colourful meadows in bloom — this is the beautiful Garry oak ecosystem. Found at the southeastern tip of Vancouver Island, and on a few islands surrounded by the Salish Sea, this unique habitat holds on in fragmented pockets. These meadows are home to some of the highest concentrations of species at risk in Canada, with over 70 rare and threatened plants" (CBC, 2021).
Video Credit: These beautiful island meadows are some of Canada's most threatened ecosystems(CBC, 2021)

As noted by the Garry Oak Preservation Society (2024) "Garry oak (*Quercus garryana*) woodlands are an important link to the past. Garry oak distribution has ebbed and flowed between the ice ages. During the current post-glacial period, Garry oak forests reached their largest extent during the warm, dry era, 5000 to 8000 years ago.
Before the ice ages, British Columbia also had a varied hardwood forest with many kinds of deciduous trees, including oaks. While deciduous woodlands may not be as

familiar to many British Columbians as coniferous ones, they are one of the most common vegetation types in the temperate climates of the world.

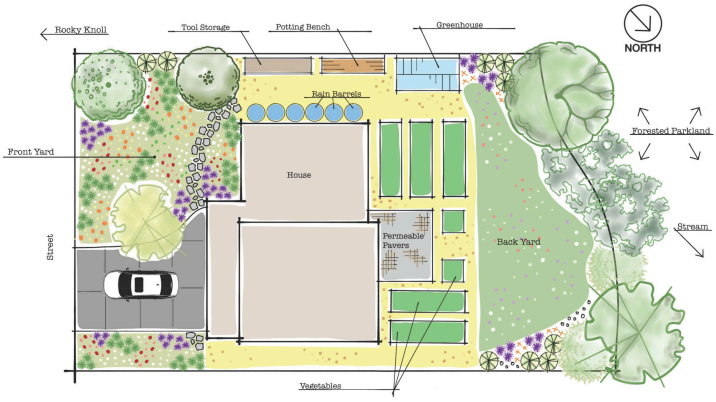
The advent of the current wetter, cooler climate changed the distribution of many plant species and reduced the range of some. This change in climate probably accounts for the patchy occurrence of Garry oak ecosystems and their associated species. Their ability to survive on well-drained soils, on steep south and west-facing slopes, and on sites with exposed bedrock accounts for their present distribution in today's Mediterranean-type climate. The important exception is the deep-soil parkland of southeastern Vancouver Island" .

The Garry Oak Ecosystems Recovery Team (2024) notes that "prior to European settlement, much of southeastern Vancouver Island was dominated by Garry oak ecosystems, playing an important role in the rich and complex culture of the First Nations of this region. In the past, some First Nations deliberately burned selected woodlands and meadows to maintain open conditions and promote the growth of berries, nuts, and root vegetables such as camas".

We gratefully acknowledge the Coast Salish Peoples, who nurtured the rich Garry oak ecosystems and cultivated species relationships through traditional stewardship practices, so we may have the opportunity to learn about these plants and their roles in supporting biodiversity in natural and built landscapes.

Regenerative Landscape Base Plan

Let's take another look at the regenerative landscape base plan again.



The Regenerative Landscape Design

Key Features of the Regenerative Landscape Plan

In this module, we will explore the benefits of meadow installations as an alternative to traditional lawns, which have been a common feature in front yard landscapes for many years. As the climate changes, we are seeing enhanced watering restrictions that limit homeowners to watering on certain days or times, and often lawn watering isn't allowed.

While lawns are often viewed as low-maintenance, it is important to consider their impact on the environment. Every spring, lawns require annual maintenance practices such as dethatching, coring, liming, fertilizing, and reseeding, all of which require equipment that is typically fossil fuel-powered. Additionally, the turf grass seed used to reseed lawns is often

grown on a commercial scale and transported back to the consumer, adding to the carbon footprint. Throughout the season, the use of herbicides and fertilizers is also common, but these chemicals can leach out of the soil and travel through storm drains into larger bodies of water, harming the environment and potentially impacting human health. This chapter will discuss how meadow installations can increase biodiversity, wildlife habitat, and carbon sequestration, and support a healthier environment.

But first, a full disclosure. The residents of this landscape kept a small patch of turfgrass-alternative lawn for their family dog. The family dog mostly tears up the lawn while playing fetch; however, the residents tolerate this behaviour because it's their dog's favourite pastime and their beloved friend brings the family a lot of joy.

The decision to include a meadow in the front garden of the regenerative landscape was not only based on the goal of increasing biodiversity but also guided by the growing number of drought-enforced bylaws in Southern communities in the United States that limit the building or remodelling of lawns to a small percentage of the available landscape area. These recent lawn-size restrictions aim to **reduce water usage**, **lower maintenance** and **fossil fuel consumption.**

In light of these restrictions and the environmental benefits of meadow plantings, it is recommended that lawn installation be reconsidered in favour of **restoring natural resources**, **supporting native pollinators**, and **increasing biodiversity** through meadow installations. Meadows not only provide wildlife habitat in both urban and non-urban areas but are also low-maintenance and have a high impact *for* the ecosystem.

Another important feature of meadow installations is the

increase in **diverse and productive plant materials** used that can offer year-round biodiversity benefits. It's possible to use a mix of native or non-invasive (this may depend on availability) ornamental perennials and woody shrubs or trees in a meadow installation to increase diversity and habitat.

A benefit of biodiverse meadow plantings is their effectiveness in removing carbon from the atmosphere and providing cooling through evapotranspiration. Carbon sequestration and evaporative cooling have proven to be effective and efficient methods to reduce global warming and the effects of climate change.

Although lawns have their drawbacks, they also offer some regenerative benefits. In the back garden of the regenerative landscape, an alternative lawn mix has been used, along with bulbs interplanted throughout.

This lawn contributes to carbon sequestration and the infiltration of water into the soil, and it provides slope and soil stability through plant root systems. Lawns are also safe spaces for children and pets to play. To boost biodiversity in lawns, it is recommended to use alternative lawn mixes that include native and non-invasive seed mixes, which can increase plant diversity and provide food sources for pollinators when flowering.

Bulbs can be interplanted throughout the lawn in the regenerative landscape, providing diversity in plant species to support native pollinators. Since bulbs typically bloom in spring and fall and go through a period of dormancy in the summer, they do not require additional water during typically dry periods.

Photo credit: Kelsey Cramer

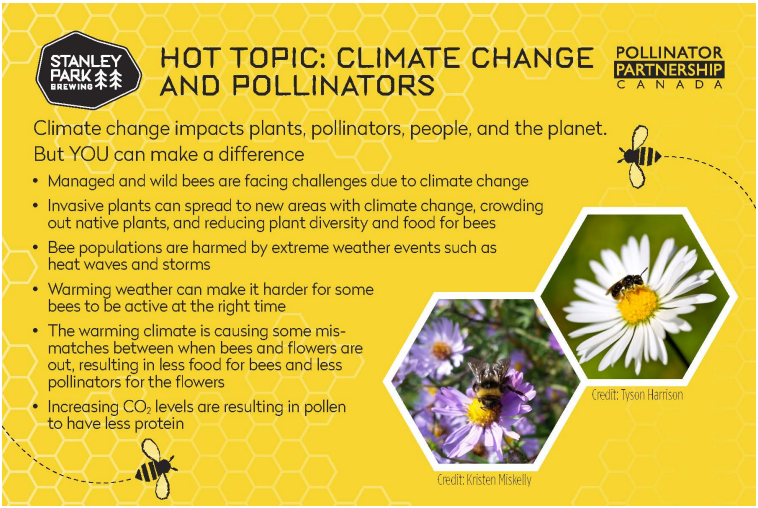
More Ways to Increase Biodiversity

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1218#oembed-2

Barwon Water Education Officer Fernando shows you how to build a bug hotel to encourage insects into your garden". (Barwon Water,2021).

Tip – to make your bug hotel more sustainable, save the plant debris such as leaves, stems and bark from the landscape that your bud hotel will be placed in to ensure the bug hotel reflects the space it will permanently reside.

Video credit: How to Make a Bug Hotel, (Baron Water, 2021)



(Pollinator Partnership Canada, n.d)

How to Install a Meadow from Seed

Please see the additional resources section for existing meadow installation guides specific to your region. Keep in mind that the meadow installation guide provided in this module is tailored to Vancouver Island.

If a guide for your region is not available, the authors encourage you and your students to take the initiative and develop a meadow-makers guide to promote biodiversity, support pollinators, and enhance community health in your area.

By doing so, you can become a champion for your region and make a positive impact on the environment. We challenge you to install a meadow with students to increase biodiversity!

Satinflower NURSERIES
native plants, seeds & consulting

Sowing Your Seed INSTRUCTIONS

SEEDING WITH NATIVE SPECIES

WHAT ARE SEEDS?

Seeds are the embryos of a plant that will grow into a new plant. They are usually wrapped in a tough exterior layer for protection (seed coat) and contain some stored food (endosperm).

TIMING

Different species vary on when best to be sown from seed. Some species are adapted to germinate with the first rains at the end of summer and grow throughout the warm, moist fall season. These seeds should be planted at the end of summer or early in the fall to maximize the growing season. Others are adapted to germinate after winter has passed and require a period of cold, moist stratification. These seeds should be planted in the early fall so that they can stratify naturally. Stratification length varies between species.

SEEDING STRATEGY

Seeding can be a cost-effective way to cover larger areas and result in a natural assemblage of native plants. Seeding done well can function to minimize soil erosion and prevent invasion by weedy species. Sometimes a phased seeding plan is effective to introduce a few species first that can quickly establish, and then in following years or seasons, other species can be interseeded to increase native plant diversity. In some cases, a "nurse plant" can be introduced first to facilitate the establishment of other species that are planted later (e.g. seeding of sun-loving species while shade is created). As part of a phased seeding approach, less vigorous species can be planted ahead of vigorous species to ensure their establishment. In future years, the more vigorous species can be added.

SITE PREPARATION

Good preparation is critical to the establishment and survival of plants sown by seed. In general, seeds require good seed to soil contact, steady moisture, and to remain undisturbed during their establishment. Surface roughening prior to seeding can improve germination success by allowing for seed to soil contact...

WHEN TO SOW YOUR SEED?

Most native wildflowers are adapted to be sown in the fall, to mimic when the seed naturally drops after the dry summer. Despite this, some species can also be sown in the early spring. The species listed below will still germinate if sown in the early spring (Feb/March), but the most successful germination of native seed is done by fall sowing.

PERENNIALS

Entire-leaved Gumweed
Yarrow
Pearly Everlasting
Woolly Sunflower (below)
Field Chickweed
Spring Gold
Coastal Sage

ANNUALS

Sea Blush
Small-flowered Blue-eyed Mary
Farewell-to-Spring (left)
Small-flowered Forget-me-not
Miner's lettuce

SEED STORAGE

Seeds should be stored cool and dry if they're not planted right away. Paper envelopes prevent moisture build-up. Seeds in paper envelopes can be stored in a dry place away from sun like a cupboard if they're sown relatively soon after purchase.

For longer shelf life, place the paper envelope in a sealed plastic bag and keep in the refrigerator. In general, we recommend sowing within the first year after purchase, though some seeds can be stored much longer.

On compacted soils, the ground can be roughened, raked, or tilled **before seeding** to break up the surface and allow seeds to fall into crevices, which help retain moisture for germination. There are a diverse array native plants that will thrive in any soil type, including nutrient poor, gravelly, or clay soils. Site preparation also includes dealing with undesirable plants and weedy seed banks ahead of seeding. Approaches will vary depending on the site but may include methods such as hand weeding, solarization, mulching, tilling, smothering, and herbicides. Sometimes minimizing soil disturbance can help reduce problems associated with weedy seed banks.

SEEDING DEPTH

It is essential that seed is sown at an appropriate soil depth to ensure germination and successful growth. Different seeds have different light, moisture, and temperature requirements. **Seeding onto the surface of the soil is best** for the majority of species we carry (see site prep above). As a general rule of thumb, **seeds should only be buried as deep as they are long.** Sowing on the surface and raking lightly can be effective.

Dilute that seed! We recommend **1/2 cup carrier** for every **1 m² of area** to cover

BROADCASTING SEED

Broadcasting places seed on the soil surface instead of underground, whether by hand or with a seed spreader. Using an inert "carrier" such as vermiculite, perlite, sand, or sawdust with the seed can allow it to be spread easier, distribute more evenly, and help you visually track where the seed has already fallen. A general ratio to follow is **1/2 cup of carrier for every 1m² of area to cover.** Seed spreaders are commonly used to distribute lawn seed or agricultural seed, but they can be effective tools for broadcasting larger amounts of seed over your site. If using a spreader, ensure the unit has settings to accommodate small-sized seed. Other techniques like drill seeding and hydroseeding may become available in our area over time for native seed blends.

COLD STRATIFICATION

Some perennial seeds need a period of moist and cold conditions before they will germinate, which is called cold stratification. Some perennial seeds need a period of moist and cold conditions before they will germinate, which is called cold stratification.This is how native plants have adapted to the local climate. Germinating in cool/moist conditions prevents seedlings from drying out in the hot summer or freezing in the winter. **Great Camas, Common Camas, California Oatgrass, Nodding Onion, Red Columbine, and Broad-leaved Shootingstar** are just some examples of species that require cold stratification and should be sown in the fall.

CHOOSING THE RIGHT SPECIES

This is one of the most important factors in developing an appropriate seed combination for a given site. Numerous factors must be taken into account such as project goals, budget, and maintenance abilities, as well as a suite of biological factors such as light, moisture, soils, and other environmental conditions. These considerations will influence species composition, grass-to-flower ratios, ratios of different species in the blend, seeding rates, and timing of inclusion for particular species. An understanding of the ecological behaviour of the various species and germination rates as well as site preparation and seeding techniques must also be considered when designing a seed blend. Consultation with an expert is often necessary when choosing and designing an appropriate seed blend.

TIMELINE

Starting a plant from seed can take time but can be very rewarding and yield a natural-functioning space. The timeline of events depends almost entirely on the type of species in the blend and is impacted by a range of factors like site preparation methods and competition by invasive species as well as competition among the native species themselves. Weather patterns and timing of seeding dramatically affect seeding success and other outcomes as well. In general, a diverse seed blend sown in fall will show some germination in the fall of the sowing and then go through a period of relative dormancy through the winter. The following spring there will be a second flush of germination from species that require cold stratification. Some species flower in their first year, while others may quietly put on growth through several seasons before flowering. Patience is key and minimizing disturbance through the fragile periods is essential. Some seed blends can be sown in the spring if they include spring-germinating species (these same species can be sown in the fall as well). Because spring rain may be intermittent, spring sowing will be more successful if the site can be watered and if the sowing is done early (February/March).

Plants like White Fawn Lily (right) and Great Camas (left, above) can take up to seven years to bloom from seed and require patience. They are certainly well worth the wait!

MAINTENANCE

Native plants have a reputation of being little-to-no maintenance, but the truth is that almost all planted spaces require at least some maintenance to thrive continually or to meet various project objectives. Most native plants are susceptible to deer-grazing, so using deer-resistant species or otherwise protecting from deer may be required, particularly in the early-establishment phase. Rabbits, slugs, and birds can also pose a threat. All plantings, big and small, require a certain level of preventative and adaptive maintenance. For meadow spaces, periodic mowing or burning is required to reduce thatch buildup and open up space for new recruitment, particularly by annual species. Watering may also be necessary for some types of planting or to meet objectives. However, there are a variety of plantings that can be done without any supplemental watering, particularly when sown in the fall.

LOOKS CAN BE DECEIVING

Seed size varies tremendously depending on the species. From a speck of dust to the size of a pea, the volume of seed you receive may appear much less than what you were expecting. Contact us for more information on seed volume.

BENEFITS OF GROWING FROM SEED

- ✓ Learn multiple stages of plant life cycle
- ✓ Complete coverage & natural balance
- ✓ Reduced cost & labour; beneficial for larger scale projects
- ✓ Preserved genetic diversity
- ✓ Reduced waste

CHALLENGES OF GROWING FROM SEED

- ✓ Timing is critical; Many native seeds must experience a winter to germinate (cold stratification)
- ✓ Patience; some species take a long time to flower
- ✓ New seedlings are fragile and susceptible to damage by birds, slugs, trampling, frost and even our own weeding errors!

HELPFUL TERMS TO LEARN AS YOU GROW

STRATIFICATION is a process of treating seeds to simulate natural conditions that the seeds must experience before germination can occur.

GERMINATION is the stage of plant growth when the seed begins to sprout. Each seed is triggered to germinate from a combination of water, temperature, and sunlight.

INTERSEEDING means to add seed to an already vegetated area.

WHY PURCHASE SEED FROM US?

Satinflower Nurseries offers one of the largest native plant seed selections on Southern Vancouver Island. Did you know the genetics of our seeds is local? Our seeds originate from field grown plants (not wild collected) and grown without the use of herbicides, pesticides (including neonicotinoids), or chemical fertilizers. This parent stock has been grown from wild seed sources in the Victoria area.

Field grown plants are carefully tended throughout the year and seeds are harvested by hand through the spring and summer. Once collected, seeds are sold in pre-made blends, packages, and in wholesale quantities.

We specialize in custom blends to suite your specific project needs. Some of our seeds are readily available at the nursery during our regular business hours, but for a full selection, visit our website or contact us by e-mail.

LOOKING FOR CUSTOM PACKET LABELS?

We offer seed in custom pre-packaged seed packets for special events (wedding favours), promotional giveaways, business gifts, and more. Send us an email to get started!

Spring Gold *Lomatium utriculatum (below)*

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FOR MORE INFO...
satinflower.ca
778-679-3459
info@satinflower.ca

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. What does biodiversity mean to you, and how do you incorporate plant diversity into your work?
2. Which bioclimatic zone do you live in, and what are the Indigenous (native) plants that inhabit this area?
3. What role do you feel you have in changing the landscape, and how can you promote biodiversity and restore the ecosystem and environmental health?
4. How can you be a good neighbour to your ecosystem and environment in your role as a landscape horticulturist?
5. Which plants make up meadows in your region? What growing conditions do they prefer, and how might you create those conditions in a residential

landscape?

Additional Resources

We've compiled a list of additional resources to support your learning about the topics in this chapter. The additional resources are not required as part of this course, please engage with them as you need to support your learning.

Resource Name	Resource Description	Resource Link
Unesco's Commitment to Biodiversity (Global)	"This publication highlights some of UNESCO's biodiversity-related actions and solutions, based on the Organization's unique mandate and its diverse normative instruments, networks, programmes and partners. These actions have reduced biodiversity loss and improved the lives of many people around the planet.For each thematic challenge, the publication highlights current actions and solutions that have been successfully implemented, as well as suggestions for improvement and innovation. This publication is an invitation to positive action and to trust in our collective capacity and creativity to transform our relationship with biodiversity, by sharing values, solutions and knowledge for our common future"	Unesco's Commitment to Biodiversity

Pollinator Partnership Canada: Pollinator Planting Guides (Canada)	"Our ecoregional planting guides, Selecting Plants for Pollinators, are tailored to specific areas of Canada. Whether you are a farmer of many acres, a land manager of a large tract of land, or a gardener with a small lot, you can increase the number of pollinators in your area by making conscience choices to include plants that provide essential habitat for pollinators"	https://pollinatorpartnership.ca/en/ecoregional-planting-guides
Satin Flower Nurseries (Victoria, BC)	Planting guides for encouraging pollinators and butterflies and designing hedgerows and meadows.	https://satinflower.ca/blogs/learn/tagged/pollinators

Habitat Acquisition Trust (Victoria, BC, Canada-wide resources in "Learn")	"Creating a naturescape (native plant garden) on your land is **part of the solution** to habitat loss. The actions of many individual landowners can make a **big difference** for wildlife in our region. A changing climate and booming population growth are forcing communities to rethink our prolific outdoor water use. Using showy native plants in your garden can also save you time and money; forget about watering, artificial fertilizers, and toxic pesticides. Because native plants have evolved in this climate for countless generations, they attract local songbirds and insect pollinators. The various plants in this guide fit into any type of garden setting"	https://hat.bc.ca/

PART III

Chapter 3 Plants with Benefits

Chapter 3: Plants with Benefits

Photo by Matthew Smith on Unsplash

Learning Intentions

By the end of this chapter, you may be able to …

- Identify and describe plant selection characteristics to promote environmental, economic, and social sustainability.
- Identify native and invasive species local to your region.
- Describe your role as a landscape horticulturist in

the spread of invasive species and evaluate tools and practices to stop the spread of invasive species.

Let's Review

Let's begin with a review of Chapter 2 where we looked at biodiversity and how it refers to the variety of plant and animal species that exist in a given landscape. Biodiversity is important for maintaining a *greener*, healthier, and more sustainable ecosystem, and landscape horticulturists can promote biodiversity by using native plants, creating habitats for wildlife, and avoiding the use of harmful chemicals.

Overall, prioritizing biodiversity in landscape horticulture can help create resilient and thriving landscapes that regenerate and reciprocate with the local environment. The guiding questions in Chapter 2 asked you to reflect on your role in the wider ecosystem as a landscape horticulturist and describe how you may influence the landscape and be influenced by the landscape through your choices and actions.

Introduction

Keywords: drought tolerance, heat tolerance, provenance

Our theme in Chapter 3: Plants with Benefits is how selecting the ***right plant for the right place*** is essential for long-term plant health and plant success in the landscape and wider ecosystem in a warming climate. In this chapter, we will look to natural ecosystems for examples of landscape management strategies and discuss the damaging role invasive species have on natural ecosystems. Finally, we will introduce alternative considerations for selecting plants and the benefits these plants have on the environment and society.

The concept of the right plant for the right place is threaded throughout the pan-Canadian harmonized landscape horticulture competencies across Canada. When selecting plant material for a landscape, we know to consider certain ***characteristics,*** such as:

1. **The environmental conditions:** when selecting plants for a particular area, it's important to consider the environmental conditions of that area. Factors such as sunlight, temperature, soil quality, and moisture levels should be taken into account. for example, a plant that requires full sun and well-draining soil will not thrive in a shady and moist location.
2. **The mature size:** another important factor to consider is the mature size of the plant. Some plants grow very tall and wide, while others remain small and compact. Choosing the right size plant for the space you have will help prevent overcrowding and ensure that each plant has enough room to grow and thrive.
3. **The plant's specific requirements:** before selecting a plant, we can research to learn about its specific needs and requirements. This includes things like soil pH, watering frequency, and pruning needs.
4. **Choosing plants that suit the *purpose*:** we think about the purpose of the plant in the landscape. We consider if we want or need the plant to provide shade, attract pollinators, or serve as a focal point. Different plants serve different purposes, and choosing the right one will help ensure an appropriate feel to the landscape and that it serves a

broader function in the ecosystem.

This image was created with the assistance of DALL·E 2

Due to the emanant effects of climate change, it's becoming increasingly important to select plants that can adapt to changing weather patterns and extreme weather events. Recent adaptive trends for plant selection in the landscape industry include choosing or considering plants based on:

1. **Drought Tolerance:** as temperatures rise and rainfall patterns change, drought conditions are becoming more common in many regions. Choosing plants that are adapted to low-water conditions can

help ensure that your garden thrives even during dry spells. Look for plants that have deep roots and can store water, such as succulents and cacti, or those with waxy leaves that can reduce water loss.

2. **Heat tolerance:** with higher temperatures becoming more common, it's important to choose plants that can withstand extreme heat. Look for plants that are native to warmer climates or those that have been bred for heat tolerance.
3. **Ability to handle flooding:** (i.e hydrology restoration) as rainfall patterns change, some regions may experience more frequent and intense flooding. Select plants that can handle wet soil conditions, such as ferns, cattails, and non-invasive irises. Additionally, consider planting in raised beds or using rain gardens to help mitigate the effects of flooding.
4. **Ability to handle extreme weather conditions:** climate change can also bring more extreme weather events, such as strong winds and hailstorms. Look for plants that are resistant to damage from these events, such as shrubs with flexible branches or plants with thick, waxy leaves.
5. **Geographic provenance or Indigenous (native) plants:** plants that are native to your region are more likely to be adapted to the local climate and can often withstand the effects of climate change better than non-native species. additionally, planting native species can help support local ecosystems by providing food and habitat for local wildlife.
6. **Pollinators:** the video below from Pollinator

Partnership Canada provides reasons why landscape horticulturalists should choose plants to support pollinators and how we can apply these practices in the landscape.

Overall, choosing plants that can adapt to a changing climate is an important part of creating a *greener, more* resilient, and more sustainable garden. By selecting the right plants, you can help ensure that the plants in landscapes thrive even in the face of climate change.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1231#oembed-1

"We are excited to share with you a short animated video about the importance of pollinators, their relationship with native plants, and ways to help! This short video is perfect for sharing with friends, family, and colleagues to get them excited and talking about pollinators" (Pollinator Partnership, 2022).
Video credit: Native Plants and Pollinators: A Symbiotic Partnership (Pollinator Partnership, 2022)

Plants with (Alternative) Benefit(s)

Keywords: carbon source, carbon sink, photosynthesis, carbon sequestration, hydrological restoration, wildlife habitat

To select appropriate plant material, landscape horticulturalists need to consider the potential benefits of plants to humans and, more importantly, to the wider ecosystem network.

Landscape horticulturalists can look to their local and natural ecosystems for examples of how to effectively select plants and manage landscapes. Let's first look at the role of forests, also known as the lungs of the earth, as an example of the ecological roles and benefits of plants.

"Forests can act as either carbon sources or carbon sinks.

- A forest is considered to be a ***carbon source*** if it releases more carbon than it absorbs. Forest carbon is released when trees burn or when they decay after dying (as a result of old age or of fire, insect attack or other disturbance).
- A forest is considered to be a ***carbon sink*** if it absorbs more carbon from the atmosphere than it releases. Carbon is absorbed from the atmosphere through **photosynthesis**. It then becomes deposited in forest biomass (that is, trunks, branches, roots and leaves), in dead organic matter (litter and dead wood) and in soils. This process of carbon absorption

and deposition is known as **carbon sequestration**" (Government of Canada, 2022).

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"Woods and trees are one of the best ways to capture and store atmospheric carbon. But how do they do it? Here's the science made simple. Take a journey into the leaf of a tree with our animation and discover how they capture and store carbon". (The Woodland Trust, 2021).
Video credit: How Trees Capture and Store Carbon, (The Woodland Trust, 2021)

"Climate change is expected to have a profound impact on the carbon balance of Canada's forests. The biggest short-term impacts will result from changes in disturbance regimes. For example, scientists at Natural Resources Canada's Canadian Forest Service predict that the forest area annually burned in Canada is likely to double by the end of the century, resulting in large emissions of carbon.

More frequent and longer-lasting droughts are expected to contribute to this increase. Similarly, increases in the area and intensity of insect outbreaks are expected to cause carbon losses. Already, climate change, in the form of warmer winters,

has contributed to the major infestation of the mountain pine beetle in British Columbia and its recent spread over the Rocky Mountains into Alberta. A key question is whether the insect will be able to expand its range through Canada's boreal forests.

Some aspects of climate change, such as longer growing seasons or greater concentrations of carbon dioxide in the atmosphere, are expected to increase tree productivity (at least initially). A warmer, wetter climate may also enhance decomposition rates. Northern regions of Canada are expected to warm faster than more southerly areas, resulting in the melting of permafrost; this may release methane from frozen soils and initiate the decomposition of previously frozen organic carbon" (Government of Canada, 2022).

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Now, let's take a look at an example from Foresty, a horticulture-adjacent industry for factors to consider when making land management decisions and the impact of decisions on the environment, economy and society.
"Forest management is not one size fits all. Different forest types, different ownership and different objectives create a vast mosaic of forest management across the Oregon landscape. In 2015 the City of Astoria entered into a

voluntary carbon project that sold carbon credits from the management of their watershed. The purpose of this forest carbon project was to generate non-timber revenue that diversified income streams from traditional timber harvest within the watershed. Managing a forest for carbon credits takes a specific kind of management that requires a lot of planning upfront, along with a number of partners to make it all come together"(Oregon Forests, 2022)
Video Credit: Different Forests. Different Goals. Carbon Storage (Oregon Forests, 2022).

Let's think about a few of the most common work environments for a landscape horticulturist. Some typical work environments for landscape horticulturalists include residential gardens, commercial or industrial greenways, city or municipality boulevards or parks, or even botanical gardens.

Wherever the work environment is, it's part of our role as landscape horticulturalists to contribute to the ecosystems that we disrupt through our work. Equally important, landscape horticulturalists need to advocate plant selections that **sequester carbon**, improve **hydrology restoration** and promote **wildlife habitat.** So, how can landscape horticulturalists support carbon sequestration in our plant selection process? The answer is obvious: plant more plants, and in particular, plant more trees! However, with changing climates and unpredictable climatic events, it can be challenging to select plants that will survive in the landscape over the long term.

Two resources to support landscape horticulturalists' plant selection choices are:

1. Canada's Plant Hardiness Zones which now include climate modelling projects for plant species: Canada Plant Hardiness Zones – Climatic Modelling
   This site explores the relationship between plants and climate across Canada. One portion of the site is dedicated to plant hardiness zone maps, which have traditionally been used by gardeners to help select which plant species to grow in their area. Another part of the site presents maps and models that summarize the climatic requirements of thousands of plants from across North America. A final aspect of the site gathers data and provides summaries about plants that occur in your area.
2. i-Tree Species, this tool helps you select the most appropriate tree species based on their potential tree benefits and your geographic area: i-Tree Species
   Users can start by choosing their location, then select and rank the importance of 0–10 of the desired tree benefits, such as carbon storage, air pollution removal, stormwater impacts, building energy conservation, air temperature reduction, ultraviolet radiation reduction, pollen allergenicity, and wind reduction.

Holistic Plant Selection

Keywords: edible or medicinal plants, Indigenous (native) plants, land management strategies

We invite you to recall and reflect on the principles of Two-eyed Seeing for this section in particular. In addition to supporting environmental and environmental pillars of sustainability, selecting plants from a holistic lens can support social and cultural pillars of *greening* and sustainability.

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"In this profoundly hopeful talk, Diné musician, scholar, and cultural historian Lyla June outlines a series of timeless human success stories focusing on Native American food and land management techniques and strategies. Lyla June is an Indigenous musician, scholar and community organizer of Diné (Navajo), Tsétsêhéstâhese (Cheyenne) and European lineages. Her dynamic, multi-genre

presentation style has engaged audiences across the globe towards personal, collective and ecological healing. She blends studies in Human Ecology at Stanford, graduate work in Indigenous Pedagogy, and the traditional worldview she grew up with to inform her music, perspectives and solutions. Her current doctoral research focuses on Indigenous food systems revitalization" (TEDx Talks, 2022)
Video Credit: 3000-year-old solutions to modern problems, Lyla June, (TEDx Talks, 2022).

Other considerations when selecting plants for the landscape and ecosystem are the historical medicinal or edible purposes of plants used by Indigenous peoples. By investigating and understanding the historical and cultural context of plant use, horticulturalists can make respectful decisions when selecting plants that reflect a particular landscape that will then influence and become part of the environment in which they plant.

We invite you to read this short article, Traditional Plants and Indigenous Peoples in Canada authored by Turner et al., (2021) which shares the relationship between traditional plants and Indigenous peoples in Canada.

Traditional Plants and Indigenous Peoples in Canada
"Indigenous peoples in what is now Canada collectively used over a 1,000 different plants for food, medicine, materials, and in cultural rituals and mythology. Many of these species, ranging from algae to conifers and flowering plants, remain important to Indigenous

communities today. This knowledge of plants and their uses has allowed Indigenous peoples to thrive in Canada's diverse environments. Many traditional uses of plants have evolved to be used in modern life by Indigenous and non-Indigenous peoples alike.

Food Plants

Before the arrival of Europeans to what is now Canada, Indigenous peoples practised the cultivation of food crops in a variety of fertile areas. In terms of scale, this cultivation was at its most elaborate in Southern Ontario and the St. Lawrence Lowland. Crops included the "Three Sisters" — corn, beans and squash — as well as sunflowers, tobacco and possibly sunchokes (the tuber of a species of sunflower). The Three Sisters were often planted together, in what is known as companion planting, where each plant supported the growth and nutrition of the others.

Over 500 species of wild plants provided food for Indigenous peoples in Canada. Some of these foods are similar to those eaten today: root and green vegetables, fruits, nuts, berries, seeds and mushrooms. Traditional foods like maple syrup, wild rice and wild fruit are now enjoyed in Canada by Indigenous and non-Indigenous peoples alike.

Other wild foods — some types of lichens, marine algae, and the inner bark tissues of some trees — are not normally part of the modern diet. Indigenous peoples also used plants as sweeteners, flavourings and beverages; many wild plants provided more than one type of food.

Medicinal Plants

Plants were, and still are, an important component

of Indigenous medicine. Herbal specialists were usually responsible for curing disease and maintaining health. Although administering herbal medicines was sometimes associated with ritual and in many cultures herbal curing and magical curing were virtually inseparable, these specialists were not necessarily shamans who invoked supernatural powers in healing. Sometimes, special curative and spiritual organizations existed, like the Ojibwa Midewiwin (Grand Medicine Society) in which initiates passed through stages, eventually learning the ritual and herbalism for curing disease.

More than 500 plants were used in Indigenous medicine. Specialists could administer such medicines as herbal teas, preparations to be chewed and swallowed, poultices, inhaled vapours, or a variety of other applications. Specialists could prescribe any part of a plant, either alone or in combination with other herbs.

Indigenous practitioners were skilled in the selection, preparation and dosage of herbal medicines, and traditional treatments were effective in treating a host of ailments, including wounds, skin sores, gastrointestinal disorders, coughs, colds, fevers and rheumatism. A famous example is the curing of Jacques Cartier's men of scurvy in the winter of 1535–36. The St. Lawrence Iroquoians of Stadacona treated them with a conifer tea high in vitamin C content (probably Eastern white pine).

Utility Plants

Wood was an important fuel, and as a major component of utilitarian items: buildings, dugout canoes, boxes, totem poles and implements like paddles, digging sticks, spear shafts, bows, arrows, and snowshoe frames. Indigenous

peoples turned sheets of bark, especially birch, into containers and canoes. They also used bark to cover roofs and line storage pits.

Fibrous tissues from stems, roots, bark and leaves served for twine, rope and weaving materials for baskets, mats and clothing. Indigenous peoples used tree resin as glue and for waterproofing. Plants provided dyes and pigments, scents, absorbent materials, abrasives, linings and wrappings, insect repellents, toys, recreational items, and personal adornment.

Spiritual Importance

By representing a spiritual connection with the earth, many plants provide more than just corporeal or utilitarian benefits. For example, the Haudenosaunee hold several ceremonies — like the Sap, Seed, Strawberry, Bean, and Green Corn ceremonies — that honour the interconnectivity of plant and human life.

Tobacco is of major importance to many peoples, figuring prominently in ceremonies, everyday life, and creation stories. Indigenous peoples use tobacco, sage, sweetgrass and cedar for various spiritual purposes in smudging ceremonies, where smoke is fanned over the face and head".

Teaching and Learning Examples for Instructors

Title: Investigating Indigenous Names and Uses of Plants Assignment

Objective:
This assignment aims to encourage learners to research and learn about the indigenous names and uses of plants, and to appreciate the cultural significance of plants in different indigenous communities.

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. Which native plants are endemic to your region and what relationship do they have with the endemic local pollinators?
2. What are the optimal growing conditions for the native plants endemic to your region today, in 10 years and in 50 years?
3. What role do you have as a horticulturist to support Indigenous plant populations through your plant selection decisions?

4. Draw a picture of how you see your plant selection choices shaping the environment and influencing the wider ecosystem.

Invasive Species

Keywords: invasive, environment, economy, community, competition, deteriorate, ecosystems.

"Climate change can accelerate the introduction and spread of invasive species. Together, invasive species and climate change reduce ecosystem resilience and negatively impact biodiversity". (Invasive Species Centre, 2024).

The Invasive Species Centre (2024) reports that "the effects of climate change on invasive species can include:

- More frequent extreme weather events cause stress to native species and create opportunities for invasive species movement.
- Melting sea ice opens new shipping routes and pathways for invasive species to spread.
- A changing climate can affect species' life cycles and their ability to spread into new areas.
- Increased carbon dioxide (C02) in the atmosphere leads to higher C02 uptake in plants, which can increase herbicide resistance".

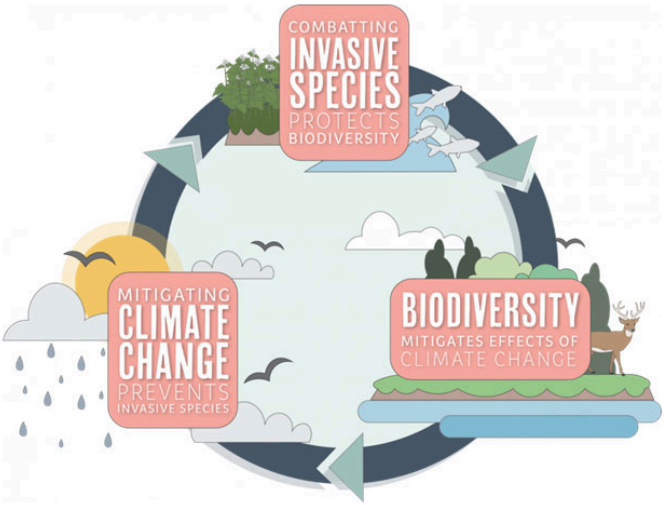

Image source: Invasive Species Centre

In recent decades, provincial governments have been working to increase industry and public awareness about the negative impacts invasive species have on the environment, economy, and communities across Canada.

> "Invasive plants are harmful non-native trees, shrubs, and herbaceous plants that are spread by global trade, human and animal transport, and gardening. They invade forests and prevent native plants from growing, which can have negative impacts on how ecosystems function, on native vegetation, and on native wildlife. Many invasive plants cannot be used by wildlife for food which puts grazing pressure on the few native plants that remain. Invasive plants also pose threats to agriculture due to their ability to spread quickly, out-compete crop and forest plants, and deteriorate soil quality. Once they have taken hold, the thick spread

of invasive plants makes them costly and time-consuming to remove" (Invasive Species Centre, n.d.).

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Invasive species degrade natural ecosystems, impact agriculture practices, interfere with forest productivity, and have social, aesthetic, and economic impacts.

The Canadian Council on Invasive Species (2023) states the following:

Degradation of Natural Ecosystems

"Natural areas such as forests, prairies, wetlands and lakes provide many ecosystem services and benefits. Natural areas provide shelter and food for wildlife, remove pollutants from air and water, produce oxygen and provide valuable recreational and educational opportunities. Invasive species threaten and can alter our natural environment and habitats and disrupt essential ecosystem functions. Invasive plants specifically displace native vegetation through competition for water, nutrients, and space. Invasive species threaten many rare and endangered species and now those species are at risk of extinction. Once established, invasive species become costly and

difficult to eradicate. Often, the impacts are irreversible to the local ecosystem. Once established, invasive species can:

- reduce soil productivity
- impact water quality and quantity
- degrade range resources and wildlife habitat
- threaten biodiversity
- alter natural fire regimes
- introduce diseases

Impact on Agriculture

Invasive plants can have a wide range of impacts on the agricultural industry. Invasive plants can act as new or additional hosts for new or existing crop diseases and crop pests, they can cause reductions in crop yields and may require increased use of pesticides to control them. This increases costs for farmers and reduces crop values. Estimated crop losses in BC agriculture industry of over $50 million annually. Species such as knapweed infest rangelands and reduce forage quality. Many other species out-compete desired species in cultivated fields (Source: BC Ministry of Agriculture, Food and Fisheries. 1998. Integrated weed management—an introductory manual). The estimated annual economic impact of invasive plants on Canadian agriculture is $2.2 billion (Environment Canada, 2010).

Interference with Forest Productivity

Invasive species, specifically invasive plants, can interfere with forest regeneration and productivity through direct competition with tree seedlings, resulting in reduced density and slowed growth rate of tree saplings. Reduction in forest regeneration and productivity results in the loss of wildlife habitat, and decreases the diversity of a stand, making it more vulnerable to insects and disease.

Social and Aesthetic Impacts

When established in crops or natural areas, invasive plants and/or species can result in:

- lost income
- reduced water quality and quantity (increased erosion and sedimentation)
- reduced property values
- damage to private property and infrastructure
- loss of traditional food and medicinal plants
- reduced land and water recreational opportunities
- increased control and management costs
- export and import trade restrictions imposed

Some invasive plants, like giant hogweed (Heracleum mantegazzianum) and wild parsnip (Pastinaca sativa), cause human health concerns because their sap is toxic to skin. Other plants can cause physical injuries to the body; common buckthorn (Rhamnus cathartica) branches end in a short, sharp thorn which may inflict injury. Human safety may also

be impacted by fast-growing invasive plants. For example, Phragmites australis (hereafter referred to as Introduced Phragmites) grows large and rapidly and may reduce visibility at rights of ways, increasing the risk of car accidents. Dead, dry stalks of Introduced Phragmites are also highly combustible and can become a fire hazard.

Natural areas in municipalities support a wealth of recreational activities including hunting, fishing, swimming, hiking, bird watching, and mountain biking. Invasive plants that invade recreational areas often reduce the area's attractive and enjoyable qualities. For example, invasive plants may reduce native plant biodiversity, affecting the number of songbirds in the area; walking through dense vegetation can prove difficult; and popular swimming areas may become unusable with the presence of invasive aquatic plants. Seeds and other plant parts can hitch rides on hiking boots, clothing, pets, birds and vehicles, resulting in new infestations, potentially over great distances.

Economic Impacts

Invasive plants can have a large economic impact on individual landowners and municipalities. A recent study shows that property values for shoreline residences in Vermont affected with Eurasian water-milfoil (Myriophyllum spicatum) were down as much as 16.4 % (OMNRF, 2012). Due to the explosion of leafy spurge (Euphorbia esula), Manitoba has experienced a $30 million reduction in land values

(CFIA, 2008). Leafy spurge infests 340,000 acres of land in Manitoba, costing taxpayers an estimated $19 million per year to protect grazing land, public land, and rights-of-way (CFIA, 2008). In Ontario, the MNRF has been involved with invasive Phragmites control pilot projects since 2007 and to date control costs range between $865 and $1,112 per hectare (OMNRF, 2012). Invasive species have an impact on approximately 20% of Species at Risk in Ontario (OMNRF, 2012).

Invasive plants directly affect municipalities with reforestation projects and recreational trails. They increase management costs (e.g. project planning and monitoring) and they increase operational costs (e.g. mowing, pruning and hand pulling). They also complicate reforestation projects as they need to first be removed, and then the gaps created through removal must be addressed by using large, potted plant stock, or additional site maintenance to prevent the risk of re-invasion.

The economic impact of invasive species in Canada is significant. According to Environment and Climate Change Canada:

- The estimated annual cumulative lost revenue caused by just 16 invasive species is between $13 to $35 billion.
- Invasive species that damage the agricultural and forestry industries result in an estimated $7.5 billion of lost revenue annually".

Invasive Species Management for Horticulturalists

Landscape horticulturalists play a crucial role in restoring and maintaining ecological sustainability by removing and preventing the spread of invasive species. By taking these proactive measures, horticulturists can help preserve the ecological balance and ensure the long-term health of our natural environments.

1. **Education**: one of the most effective strategies that we can use is to educate ourselves and our clients about the dangers of invasive species and the importance of choosing native plant species or non-invasive species.
2. **Monitor**: we can also regularly monitor landscapes for signs of invasive species and quickly respond to any outbreaks by removing or controlling them before they can spread.
3. **Sanitation**: we can implement proper sanitation practices to prevent the accidental spread of invasive species through equipment or plant material.
4. **Advocacy**: we can work with local governments and organizations to advocate for policies that restrict the import and sale of invasive plant species and promote the use of native or non-invasive plants instead.

Teaching and Learning Examples for Instructors

Assignment: Invasive Species Management Plan for Local Pest, Disease, or Weed. This assignment was created by Chatgpt and can be adapted to your region and class learning outcomes.

Here is an example of a clean equipment protocol to reduce the spread of invasive species from the Ontario Invasive Plant Council (2023) to use as an example when building a clean equipment protocol with students in your class.

Clean Equipment Protocol for Industry – Summary

Invasive species are plants, animals and microorganisms that have been accidentally or deliberately introduced into areas beyond their normal range, that out compete native species. Invasive species are a major threat to Ontario's natural areas, and are very costly to deal with once established.

Invasive species can be spread to new areas by contaminated mud, gravel, soil and plant materials on vehicles and machinery.

The best practice is to prevent the spread of invasive species. By inspecting and cleaning equipment and following some simple guidelines, the risk of spreading invasive plants is greatly reduced.

- Identify invasive plants and plan activities accordingly (i.e. schedule work in areas without invasive plants first, leaving infested areas til the end, to reduce the risk of unintentionally moving plants into a new area).
- Record & report sightings of invasive plants (Invading Species hotline at **1-800-563-7711** or online **www.invadingspecies.com/report/** or **www.eddmaps.org/Ontario**)
- Inspect vehicles and machinery before and after entering sites or conducting work along roadways & waterways.

How to Inspect

Before leaving the site, inspect the vehicle thoroughly inside and out for where dirt, plant material and seeds may be lodged or stuck to interior and exterior surfaces. Remove and clean any guards, covers or plates that are easy to remove.

Pay attention to the underside of the vehicle, radiators, spare tires, foot wells and bumper bars. If clods of dirt, seed or other plant material are found, remove immediately and discard where the contamination occurred or in the garbage.

When Cleaning is required

- Safely locate the vehicle and equipment away from any hazards, ensure engine is off and the vehicle or equipment is immobilized.
- Clean the vehicle/equipment in an appropriate area where contamination and seed spread is not possible (or limited).

The site should be:

- Mud free, gravel covered hard surface, or, if this is not available, a well maintained grassy area.
- Gently sloping to assist in draining water and material away from the vehicle or equipment. Care should be taken to ensure that localized erosion will not be created.
- At least 30m away from any watercourse, water body and natural vegetation.
- Large enough to allow for adequate movement of larger vehicles and equipment.

Continued...

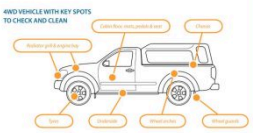
Equipment Required

- ☐ A pump and high pressure hose OR High pressure water unit
- ☐ Air compressor and blower OR Vacuum
- ☐ Shovel
- ☐ Pry bar
- ☐ Stiff brush or broom

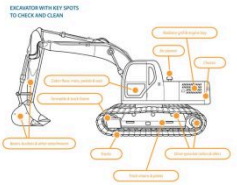
Final Inspection Checklist

- ☐ No clods of dirt should be visible after cleaning.
- ☐ Radiators, grills and the interiors of vehicles should be free of accumulations of seed, soil, mud and plant material parts including seeds, roots, flowers, fruit and or stems.

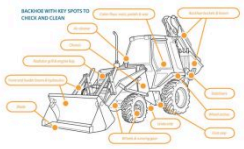
2WD and 4WD Vehicles



Excavator



Backhoe



Bulldozer

Invasive Species Centre
Catalyst for research and response

Ontario

Peterborough County-City Stewardship Council

Ontario Invasive Plant Council

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. What are the major invasive species in your region, and what is their impact on the regional ecosystem?
2. How can you identify the major invasive species in your region, and what environment do they grow in?
3. What climate change impacts are speeding up or creating the vulnerability for invasive species to occur in your area?
4. How can landscape horticulturalists stop the spread of invasive species in your region through their work?
5. What resources are available in your region to raise awareness of invasive species among industry or the public?

Regenerative Landscape: Plants with Benefits

Regenerate (to renew/restore/respect)

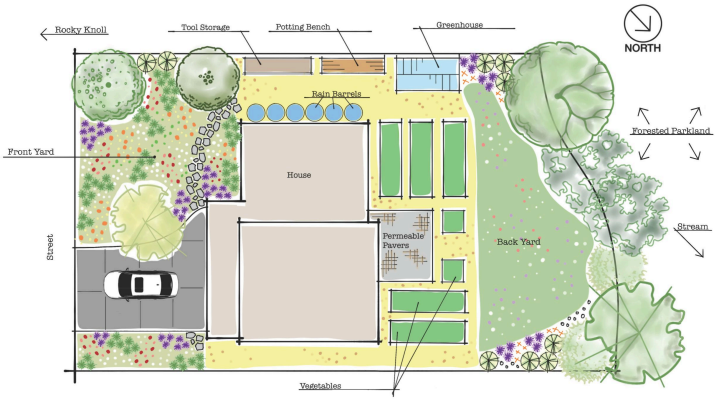
Keywords: food security, community, Indigenous (native) plants, invasive species,

Let's take another look at the base plan for the regenerative landscape for reference on the topic of plants with benefits. During this phase of construction, the forested border has been left untouched to provide wildlife habitat and encourage native plants.

The residents chose to install large raised vegetable beds for the family to produce food on-site. This not only enhances food security for the family but also for the surrounding community (due to prolific zucchini and tomato production) by reducing carbon emissions from the transportation of food over long distances. As a result, the local community can gather and share in the locally produced food, which promotes social relationships and strengthens the community ecosystem.

Another feature to showcase at this stage of construction is the informal and natural forested border between the back garden and the city park neighbouring the residential lot. When the homeowners first moved in, the border area and slope into the park were covered with invasive species. The homeowners were shocked to find some of the worst invasive species, including *Fallopia japonica* (Japanese Knotweed), *Daphne laureola* (Daphne), *Rubus armeniacus* (Himalayan

blackberry), *Ipomoea purpurea* (morning glory), *Lamium maculatum (spotted dead nettle)* and *Hedera helix* (English ivy). As a result, the residents of the landscape took action to safely remove the invasive species along the slope leading into the forested parkland.



The Regenerative Landscape Design

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. Which plants are you most attracted to in your favourite garden?
2. What sort of benefits do these plants give you and the surrounding environment?

Additional Resources

Listed general, and then west to east.

Resource Name	Resource Description	Resource Link
Braiding Sweet Grass by Robin Wall-Kimmer		Purchase at your local bookstore
Nature's Best Hope by David Tallmany		Purchase at your local bookstore
Canadian Council of Invasive Species	The Canadian Council on Invasive Species (CCIS) serves as a national voice and hub to protect Canada from the impacts of invasive species. The website contains free educational resources for the identification and management of invasive plants.	https://canadainvasives.ca/invasive-species/
Invasive Species Centre (Canada)		https://www.invasivespeciescentre.ca/

Invasive species reporting (BC)	"Invasive species are plants and animals not naturally found in B.C. that can potentially harm the province's natural environment or adversely affect people's health. Report invasive species before they cause harm through the invasive plant database or through the mobile apps".	https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/reporting-invasive-species

Invasive Species Council of BC	"Watch out for the following invasive species which have been found in BC but are not yet established in our province. Familiarize yourself with these invasive species, be on the lookout and report any suspected sightings". Free resources and courses on invasive species identification and management in BC.	https://bcinvasives.ca/take-action/identify/ https://bcinvasives.xactlms.com/courses
Invasive Plants (Alberta)	"Introduced plants that grow on land and in water that have no natural means of control and will spread quickly and reduce biodiversity".	https://abinvasives.ca/invasive-plants/

Invasive Species Council (Manitoba)	Resource for invasive plants and animals in Manitoba. "Prevention, early detection and rapid response are critical for saving habitats from invasive species".	http://invasivespeciesmanitoba.com/site/index.php?page=about-invasive-species
Invading species reporting (Ontario)	"The Invading Species Hotline serves as a valuable resource for the public, especially during times of increased public concern. Members of the public are able to call and speak with an invasive species expert to report a sighting or to inquire about invasive species information".	http://www.invadingspecies.com/programs/invading-species-reporting/

PART IV

Chapter 4 Flow

Chapter 4: Flow

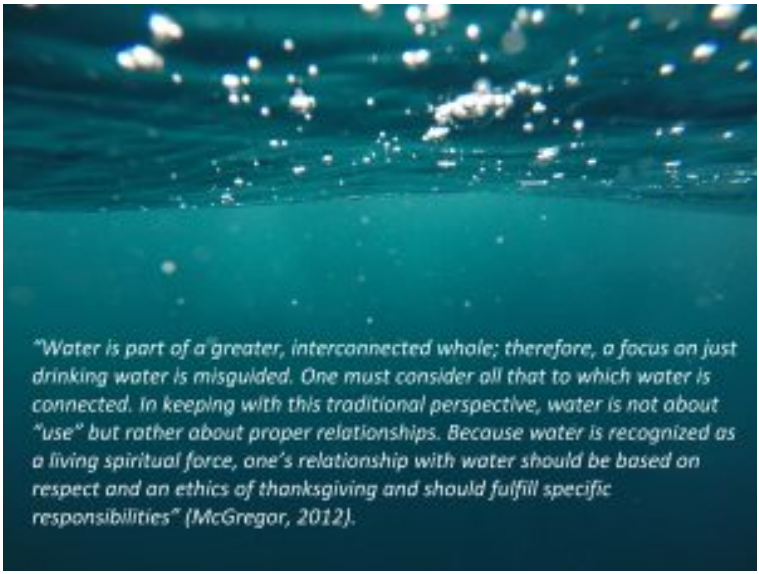


Photo by Jeremy Bishop on Unsplash. The quote is from Water Teachings, based on an article written by Dr. Deborah McGregor.

Introduction

In this chapter, we aim to explore the interconnectedness of life, land, and water. This module provides an opportunity to reflect on your relationship with water, the impacts of horticultural activities on water, and the responsibility to care.

By adopting *greener* landscape practices and working towards decolonizing water, we can contribute to a more equitable and sustainable future.

Learning Intentions

By the end of this chapter, you may be able to …

- Identify the water sources in your watershed and reflect on your relationship with water. Understanding the flow of water and how to care for it is crucial to developing responsible landscape practices.
- Evaluate current construction practices and practice skills to create landscapes that mimic nature, such as rain gardens and permeable paving (also known as green infrastructure). Green infrastructure is becoming increasingly important in mitigating the impact of urbanization and climate change on water resources.
- Influence landscape horticulturalist students and industry to adopt low-impact landscape construction and maintenance practices, considering the broader impact on water. By taking a holistic approach to landscape horticulture, we can work towards mitigating the effects of climate change and protecting water resources.

Decolonizing Water

Although Indigenous perspectives regarding water are diverse, certain traditional understandings and approaches towards water are shared across Nations. For example, water is considered life and interconnected (Guessous & Antone, n.d.). The Indigenous Peoples' Kyoto Water Declaration (2003), the Tlatokan Alahuak Declaration (2006), and the United Nations Declarations on the Rights of Indigenous Peoples (UNDRIP) (2007) highlight the comprehensive aspects of water as the foundation of physical, cultural, and spiritual existence. They also describe the potential of traditional knowledge in addressing worldwide water challenges (Guessous & Antone, n.d.).

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Video credit: Water is Knowledge (Water Teachings).

The following links offer lessons about the role of traditional knowledge and practice in protecting water

- Decolonizing Water: A Conversation with Aimée Craft – Centre for International Governance Innovation (cigionline.org)
- Indigenous Leadership Initiative
- Indigenous Watersheds Initiative

> "As Indigenous peoples, First Nations recognize the sacredness of our water, the interconnectedness of all life and the importance of protecting our water from pollution, drought and waste" (Assembly of First Nations: Honouring Water).

Water Regeneration

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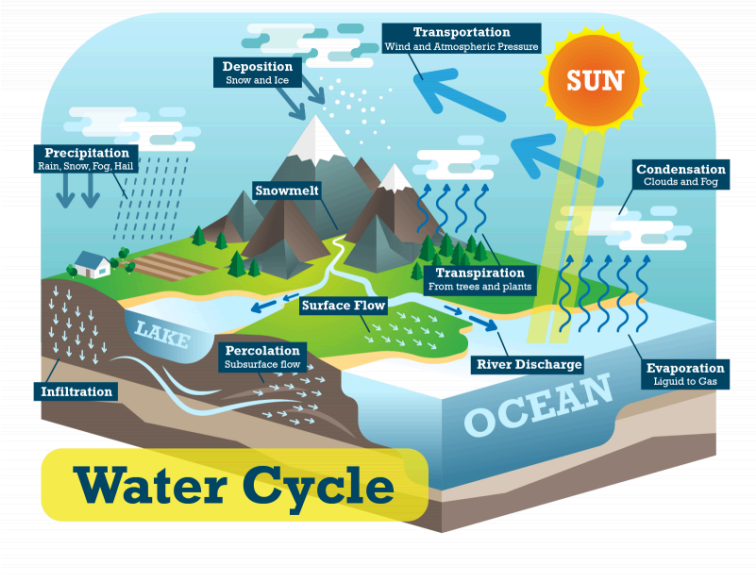
https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1261#video-1261-1

> The Water Cycle. "Water is essential to all being – humans, animals, plants, insects, fish. Water is constantly and naturally recycled through what we call the water cycle. There is never any new water on Earth. It's all ways the same old water, recycled and cleaned all over again" (Canadian Space Agency, NASA).

Connecting Water Cycles and Watersheds

The water cycle refers to the continuous process by which water moves from the earth's surface to the atmosphere and back again. There is never any new water; instead, water is recycled. Water moves through different parts of the environment in a cycle, constantly changing from one form to

another (evaporation, transpiration, precipitation, and surface flow or runoff).



The water cycle and watersheds are closely related because the water cycle drives the water movement through a watershed. A watershed is an area of land that drains into a particular river or body of water. When water falls as precipitation, it can soak into the ground, evaporate into the atmosphere, or flow over the land and into streams and rivers. As the water moves through the watershed, it can pick up pollutants and nutrients from the land and carry them downstream.

Common pollutants in rain runoff include:

1. Sediment and soil erosion: runoff from construction sites or areas with exposed soil can carry significant amounts of sediment and soil particles, which can harm aquatic ecosystems by blocking sunlight and

reducing water clarity.

2. Nutrients: fertilizers, manure, and other organic material can enter runoff and cause an overgrowth of algae and other aquatic plants, leading to low oxygen levels and harm to fish and other aquatic life.
3. Bacteria and pathogens: animal waste, human waste, and other sources of bacteria and pathogens can contaminate runoff and cause illness in humans and animals.
4. Chemicals: pesticides, herbicides, and other chemicals used in agriculture and urban areas can contaminate runoff and harm aquatic life, as well as pose a risk to human health.
5. Heavy metals: pollutants such as lead, copper, and zinc can enter runoff from industrial areas or areas with old infrastructure and can harm aquatic life and pose a risk to human health if consumed (Deng, 2021).

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Healthy watersheds are essential for maintaining the balance of the water cycle. When watersheds are intact, the land naturally

cools and cleans the water that flows through them, helping to protect and enrich downstream water resources.

However, when the natural land in watersheds is colonized and damaged by activities such as deforestation, urbanization, or pollution, they can become less effective at regulating water movement and filtering out pollutants. The water cycle and watersheds are intimately connected, with the water cycle driving the movement of water through watersheds and watersheds playing a crucial role in maintaining the health of the water cycle.

Healthy watersheds are crucial for climate change mitigation and adaptation, as they are interconnected with aquatic ecosystems and can store carbon through natural vegetation and intact soil. By maintaining healthy watersheds, we can create resilient ecosystems that mitigate the impacts of climate change (EPA, 2021).

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. Think about your relationship with water daily. Journal about your relationship with water.
2. Visit a river, lake, or shoreline in your community. Find the Indigenous place name. Reflect on the current name for that place and its previous Indigenous name. How did the location acquire these names? What are the differences between the two names? Is there any connection between them?

Green Infrastructure for Healthy Watersheds

Green infrastructure involves strategically designing and managing landscapes using nature-based solutions to address various challenges, particularly those related to water management and climate resilience. Landscape horticulturists are crucial in implementing and sustaining green infrastructure because they have expertise in plant selection, landscape installation, and maintenance. In addition, they understand the importance of integrating vegetation, such as trees, shrubs, and green spaces, into the built environment to create functional and sustainable landscapes.

One significant aspect of green infrastructure is its ability to maintain healthy watersheds. Using vegetation and natural features, such as rain gardens, bioswales, and green roofs, permeable paving, helps manage rainwater or stormwater runoff. These features capture, absorb, and filter rainwater, allowing it to gradually infiltrate into the ground, replenish groundwater sources, and reduce the burden on stormwater systems. This process helps prevent water pollution by removing contaminants and sediment before they enter rivers, lakes, and other bodies of water.

Furthermore, green infrastructure contributes to the development of resilient ecosystems. Mimicking natural processes, such as the water cycle and nutrient cycling, enhances biodiversity, promotes habitat creation for wildlife,

and supports ecological connectivity. By incorporating diverse plant species and creating green corridors, green infrastructure provides food and shelter for birds, insects, and other animals, allowing them to thrive in urbanized areas.

Regarding climate resilience, green infrastructure mitigates the adverse effects of climate change. For example, vegetation and green spaces help regulate temperature, reduce heat island effects, and improve air quality. Trees, in particular, offer shade, cool the surrounding areas, and sequester carbon dioxide, mitigating the urban heat island effect and contributing to carbon reduction efforts. Additionally, green infrastructure helps manage extreme weather events, such as heavy rainfall and flooding, by absorbing and storing excess water, minimizing the risk of infrastructure damage and flooding in urban areas.

Overall, green infrastructure works with natural processes to provide a range of benefits. It improves water management, promotes ecological health, contributes to climate resilience, and enhances the quality of life in communities. Through the expertise and efforts of landscape horticulturists, the integration and maintenance of green infrastructure can create sustainable and thriving environments.

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Rain gardens are sunken gardens that are designed to receive rainwater, and function to clean, cool, and slowly release rainwater to seep down into the ground.
Video Credit: Rain Gardens Explained in 2 minutes (Alberta Low Impact Development Partnership, 2018)

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As climate change alters the pattern of rain, communities like Vancouver are building green infrastructure to better manage and appreciate rainfall.
Video Credit: Vancouver's Rain City Strategy (City of Vancouver, 2018)

Introduction to Permeable Pavement

Permeable pavement, also known as pervious or porous paving, is a type of green infrastructure. Permeable pavement functions as a hard surface but allows rainfall to percolate to an underlying reservoir base, where rainfall is either infiltrated into underlying soils or removed by a subsurface drain (Capital Regional District, n.d.). The following videos describe how

permeable paving works, as well as the benefits and constraints.

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https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1263#oembed-3

Teaching and Learning Examples for Instructors

Download the lesson plan for the FLOW case study
Resources

- LID reading for Case Study
- TBLconcise guide
- FLIP_handout_FNL_Web
- Gallery_walk

Regenerative Landscape: Water Regeneration

Regenerate (to renew/restore/respect)

Keywords: alternative hardscape materials, permeable paving, pervious paving, porous paving, green infrastructure

Regenerative Landscape Design

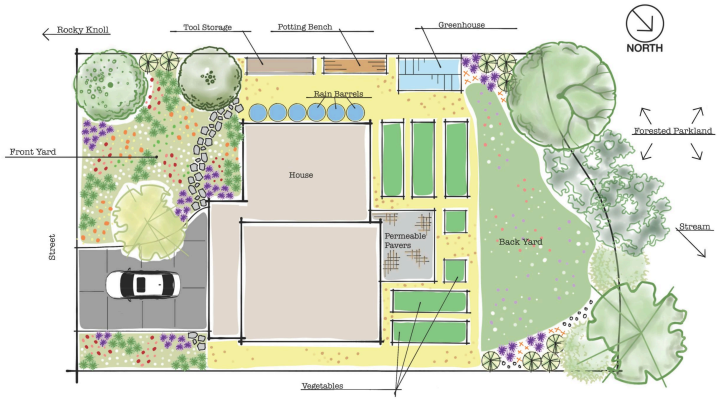
Let's review the regenerative landscape base plan again. This landscape design envisioned through a regenerative and *greening* lens, embraces the vital concept of water infiltration by eliminating any hard surfaces that don't allow water to infiltrate into the soil and regenerating the natural water systems.

Every added aspect of this design fosters the natural process of water percolating into the soil, thus rejuvenating the hydrological cycle on a larger scale. The absence of impermeable surfaces such as concrete or asphalt ensures that rainwater can freely infiltrate the ground, replenishing groundwater reserves and nourishing the ecosystem.

The landscape showcases a harmonious integration of diverse elements, including permeable pavers, alternative lawns, meadows, and mixed woody shrub hedges, all strategically placed to capture and retain water. This conscious approach not only nurtures the local flora and fauna but also mitigates the negative impacts of stormwater runoff, reducing the strain on urban infrastructure and promoting a balanced and sustainable water cycle. By facilitating water infiltration,

this landscape design connects directly to the wider hydrological cycle, contributing to the replenishment of aquifers, the maintenance of stream flows, and the overall health of our precious water resources.

*Note the driveway existed when the residents purchased the property.



The Regenerative Landscape Design

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. How can you demonstrate care and respect for water?
2. Before working on the land, what will you acknowledge, examine and plan for? As a horticulturalist, how can you nurture your relationship with water?
3. Reflect on a landscape of significance to you. Describe the water journey and responsibilities of water. How can you, as a horticulturalist work with this natural process to enhance the ecosystem's health? How can landscape make a measurable difference in improving water quality and mitigating climate change?

Additional Resources

Resource Name	Resource Description	Resource Link
Water Song: Indigenous Women and Water	The traditional relationship between Indigenous women and water.	https://www.resilience.org/stories/2016-12-12/water-song-indigenous-women-and-water/
Dirt: The Erosion of Civilizations	The importance of protecting soil is highlighted by the soil erosion triangle that relates soil and water quality (water depth, water velocity, and water volume).	https://www.ecologyartisans.com/blog/soil-erosion-meadowview-case-study
Rain Gardens 101	The video explains how to install and maintain a rain garden [17 min].	https://youtu.be/ZHeY6CUAS8s

Permeable Pavements	The factsheet provides an overview of design and installation guidelines for pervious pavements.	https://files.cvc.ca/cvc/uploads/2012/02/lid-swm-guide-apdxa-permeable-pavem
Permeable Pavements Factsheet	Permeable pavement maintenance guide.	https://sustainabletechnologies.ca/app/uploads/2018/02/Permeable-Pavement-Fact-Sheet.pdf

PART V

Chapter 5: Restore and Regenerate

Chapter 5: Restore and Regenerate

Photo by Zhugher on Pixabay.

Learning Intentions

By the end of this chapter, you may be able to …

- Apply natural systems theory to select and describe *greener* and more sustainable landscape construction and maintenance practices contributing to ecosystem health.
- Identify and select technology relevant to the landscape industry to reduce waste, increase

efficiency, and increase environmental and personal health.

Let's Review

Let's start with a review of Chapter 4: Flow. In the last chapter, we investigated how to identify water sources in the watershed and develop a personal connection with water, understanding its flow, and the importance of responsible landscape practices.

We also aimed to evaluate current construction practices and acquire skills to create landscape designs that mimic nature, incorporating features like rain gardens and permeable paving (green infrastructure) to mitigate the impact of urbanization and climate change on water resources.

Finally, we aimed to discover the influence of landscape horticulturalist students and industry professionals on adopting low-impact landscape construction practices, considering the broader impact on water. Encouraging a holistic approach to landscape construction and maintenance to promote *greener* mindsets and practices and protect water resources.

Now, let's take a look at the final chapter of this faculty training module, Restore and Regenerate, to explore how natural system processes can guide our decision-making when selecting *greener* horticulture skills and practices.

Chapter 5: Introduction

Keywords: paradigm shift, restorative, regenerative

As we seek to apply *greener* and more sustainable landscape practices, landscape horticulturalists must be aware of the impact of their practices on the greater ecosystem. By

incorporating renewable and regenerative practices into the construction and maintenance phases of a project, we can have a positive impact on the environment while minimizing disruption to ecological systems.

The final chapter in the regenerative landscape module, Renew and Regenerate, is designed to equip you with the knowledge and skills to apply natural systems theory to select and describe *greener* and sustainable landscape construction and maintenance practices contributing to ecosystem health.

The last section of this chapter will provide examples of how landscape horticulturalists can use technology to reduce waste, promote efficiency, and increase environmental and personal health. The learning intentions of this chapter aim to empower you to become respectful stewards of the environment and highlight the importance of preparing horticulture students for diverse and changing roles in the industry by incorporating technology in teaching and learning curriculum design.

There are several restorative and regenerative landscape maintenance practices that can be implemented to reduce environmental impact and increase sustainability. Some of these practices include topics that we have covered in this module already, such as:

1. **Use of native plants**: native plants are adapted to the local environment and require less maintenance than non-native species. They also support local wildlife and biodiversity.
2. **Rainwater harvesting**: collecting rainwater in a barrel or cistern can be used to water plants instead of using municipal water sources, which can help conserve water resources.
3. **Low-maintenance design:** designing landscapes

> with low-maintenance features that start with selecting the right place for the right place, drip irrigation systems, and thoughtful plant placement to reduce the need for ongoing maintenance, passive energy consumption, and help conserve resources.

Now, let's take a look at some natural system theories to guide our selection of *greener* and sustainable landscape maintenance skills and practices.

The Nitrogen Cycle

The nitrogen cycle is a natural process that describes how nitrogen moves through the environment. Nitrogen is a key element necessary for life, as it is a component of amino acids and nucleic acids, which are the building blocks of proteins and DNA.

The nitrogen cycle begins when nitrogen gas in the atmosphere is converted into a form that can be used by living organisms. This process, called nitrogen fixation, can happen through various means, including lightning strikes, certain types of bacteria, and human activities like the production of fertilizer. Once nitrogen is fixed, it can be taken up by plants and used to build proteins.

When animals eat these plants, the nitrogen is incorporated into their own tissues. When these organisms die, the nitrogen is released back into the environment through the process of decomposition. At this point, the nitrogen can either be converted back into nitrogen gas through a process called denitrification or other living organisms can take it up and continue cycling through the ecosystem.

However, it's worth noting that "when nitrogen in its active form, such as in fertilizer, is exposed to soil, microbial reactions take place that release nitrous oxide. This gas is 300 times more potent at warming the atmosphere than carbon dioxide. It also remains active in the atmosphere for more than 100

years. Algal blooms in lakes and waterways, often caused by fertilizer run-off, also emit greenhouse gases" (Un Environment Programme, 2024).

Overall, the nitrogen cycle plays a crucial role in the functioning of ecosystems and is essential for the growth and survival of living organisms.

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"What are nitrogen-fixing plants, and why use them over nitrogen fertilizer? This video answers this question through an explanation of the nitrogen cycle". (Sol, 2021)
Video credit: Understanding Our Soil: The Nitrogen Cycle, Fixers, and Fertilizer, CC BY (Sol, 2021)

The Nitrogen Cycle: Sustainable Landscape Maintenance Practices

So, how can we incorporate the principles of the nitrogen cycle into the maintenance practices we use for restorative and regenerative landscaping?

1. **Reduce or eliminate fertilizer use:** overuse of nitrogen-rich fertilizers can lead to excess nitrogen

in the soil and runoff, which can contribute to water pollution. By using fertilizers in moderation and choosing slow-release or organic fertilizers, landscape horticulturalists can reduce the amount of excess nitrogen in the environment. Or better yet, landscape horticulturalists can look to build healthy soils to eliminate the need for synthetic fertilizer additives.

2. **Use nitrogen-fixing plants:** some plants, such as legumes, have the ability to fix nitrogen from the atmosphere through symbiotic relationships with bacteria. By incorporating nitrogen-fixing plants into landscapes, horticulturalists can reduce the need for fertilizers and improve soil health.
3. **Use compost:** composting organic matter can help to improve soil health and nutrient content, including nitrogen. By incorporating compost into landscapes, horticulturalists can reduce the need for fertilizers and promote healthy plant growth.
4. **Plant cover crops:** cover crops, such as clover or rye, can be planted during fallow periods to protect the soil and improve its nutrient content, including nitrogen. Cover crops can also reduce soil erosion and improve water retention. Equally important, ensure that all loose materials are covered with a tarp or plastic when not in use to avoid leaching or washing away materials into stormwater drainage systems.
5. **Properly manage irrigation:** overwatering can lead to waterlogging, which can reduce oxygen levels in the soil and limit the availability of nitrogen

to plants.

Ultimately, we can promote healthy nitrogen cycles, soil, and plants, as well as contribute to *greener* and more sustainable landscape management by implementing these practices as part of a reciprocal relationship with the environment.

The Carbon Cycle

Keywords: carbon cycle, carbon sequestration, photosynthesis

As landscape professionals, we have a unique opportunity to promote *green* practices in our work and protect the environments we contribute to and disrupt. By implementing *green* practices in our work, we can reduce our environmental impact and create healthy, beautiful spaces for our communities to enjoy.

One key aspect of regenerative landscaping is understanding the carbon cycle and its importance in the ecosystems that we work in. Carbon is a critical building block of life, and it cycles through the air, water, soil, and living organisms in a complex web of interactions. Unfortunately, human activities like fossil fuel burning and deforestation have disrupted this delicate balance, leading to increased levels of atmospheric carbon and contributing to climate change.

But, wait, haven't we already covered the carbon cycle in Chapter 3: Plants with Benefits where we looked at the role of a forest in the carbon cycle as trees sequester carbon through the natural process of **photosynthesis?** The answer is yes, proving the importance of why landscape horticulturalists should thoughtfully consider landscape sites as highly interconnected ecosystems and acknowledge that they have a choice of how

and when they will interact and act within the ecological community.

Here is a short video to help review the process of photosynthesis and how plants use the glucose produced in photosynthesis to perform internal functions such as cellular respiration, producing glucose and amino acids, and producing and storing starch, oils, and fats. Of course, a huge benefit of the photosynthesis process is the by-product of oxygen, which all living things need to survive.

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"Photosynthesis. What is it? How does it work? Why do plants do it? What is all that glucose used for?". (Cognito, 2018).
Video credit: GCSE Biology – Photosynthesis #48, (Cognito, 2018)

So, we reviewed the process of photosynthesis,, where plants take in atmospheric carbon dioxide (C02) through their stomata combine it with water (H2O) and use light energy to produce glucose (and the constituent carbon), which is then used to power their internal functions and produces oxygen that is returned to the atmosphere. Below is the formula for

photosynthesis, note that the carbon molecule becomes part of the glucose molecule that powers plant functions in the leaves, stems, flowers and roots.

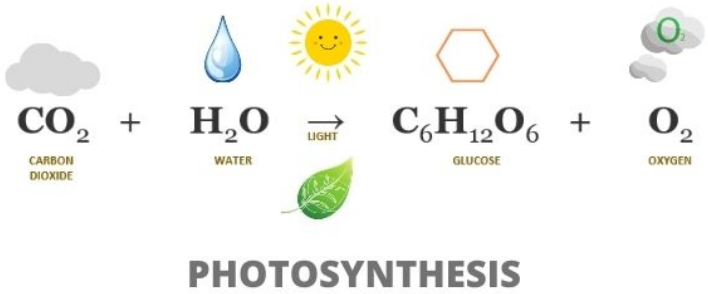

Photo by (Angela, 2021).

The Carbon Cycle: Soil

Overall, plants play a crucial role in the global carbon cycle by removing carbon dioxide from the atmosphere, storing it in their tissues and transferring carbon into the soil. This helps to mitigate the effects of climate change by reducing the amount of carbon dioxide in the atmosphere. Let's explore the topic of carbon storage in the soil.

> We encourage you to start by listening to Alie Ward's Ologies Podcast https://www.alieward.com/ologies called Indigenous Pedology (SOIL SCIENCE) with Dr. Lydia Jennings.
> "Soil! Dirt! Earth. Dr. Lydia Jennings, aka Native Soil Nerd,

breaks down the stuff under our feet and explains everything from mining to why soil can be different colors. Also: medicine from microbes, giving back to the land after extractive processes, collecting samples in urban rivers, elders' ecological knowledge, planting hot Cheetos, potting soil mysteries, lung fungus, the smell of rain and why gardening makes you happy. Oh and running hundreds of miles for your science" (Alie Ward, 2022).

Soil organic carbon (SOC) is the carbon that is stored in the soil in the form of organic matter. This organic matter is derived from the decomposition of plant and animal residues, as well as from the activity of soil microorganisms. SOC plays an important role in s**oil fertility and health,** can promote healthy nitrogen cycles, soil, and plants, as well as contribute to *greener* and more sustainable landscape management by implementing these practices as part of a reciprocal relationship with the environment for plants and microorganisms.

In addition, SOC can help to improve **soil structure, increase water-holding capacity, and reduce erosion.** SOC levels can vary depending on several factors, including climate, vegetation type, soil type, and land management practices. For example, SOC levels are generally higher in soils that are covered with vegetation and have low disturbance from tillage or other practices. SOC is also an important component of the global carbon cycle, as it represents a large **carbon sink** that can help to mitigate the effects of climate change. By increasing SOC levels, landscape horticulturalists can help to sequester carbon from the atmosphere and store it in the soil, thereby reducing greenhouse gas concentrations in the atmosphere.

If improperly managed, soil health is degraded over time by the land management practices chosen. Let's look to adjacent industries, such as agriculture, for examples of soil degradation.

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"Soils are essential for food systems. It is estimated that 95 percent of our food is directly or indirectly produced in soils. Healthy soils allow us to grow a variety of food products needed for human nutrition and each of us depends on soil productivity. Intensive land use, unsustainable soil management practices and deforestation leads to soil sealing, pollution, increases fire frequency. All these can damage soil biodiversity and its functions. We need to focus on preserving our soils before it reaches this stage. Sustainable soil management, tailored to the type of soil and its use, is an important part of food security and our lives generally. We can all play a role and our mission is to #keepsoilalive". (Food and Agriculture Organization of the United Nations, 2021).
Video credit: Mission: Keep soil alive! (Food and Agriculture Organization of the United Nations, 2021).

Now, let's take a look at the positive impact that regenerative

agriculture practices can have on the environment, in particular the soil ecosystems, in the next two videos.

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https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1279#oembed-4

"Narrated by Larry Kopald of Carbon Underground, The Soil Story reveals how soil can reverse climate change" (Kiss the Ground, 2015).
Video credit: The Soil Story narrated by Larry Kopald (Kiss the Ground, 2015)

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"Regenerative agriculture is an effective way to restore biodiversity and stabilize the climate, but what exactly is

it? This video explores three different regenerative practices that have great potential both in food production and in healing the land". (Sol, 2021).
Video credit: What is Regenerative Agriculture? (Sol, 2021)

Regenerative agriculture aims to promote the health and resilience of the ecosystem by using practices that work with nature, rather than against it. The goals of regenerative agriculture include **increasing soil fertility and biodiversity, reducing erosion and pollution, sequestering carbon**, and **improving the overall health of the land, animals, and people** involved in the production process.

The Carbon Cycle: Sustainable Landscape Maintenance Practices

Landscape horticulturalists can borrow and adapt practices used in regenerative agriculture to build a *greener* more sustainable and mutually beneficial relationship between the land and its stewards—in part, that's us! So, how can we incorporate the principles of the carbon cycle into the maintenance practices we use for restorative and regenerative landscaping to work with the natural cycles and not against them?

We have several alternative maintenance practices to choose from to improve soil organic carbon (SOC) and overall soil health. These practices aim to store carbon and promote the health of the soil and the organisms that live in it, ultimately

supporting plant, animal, and human health. Here are some examples:

1. **Reduced tillage:** tillage can disrupt soil structure and lead to the loss of organic matter. By reducing the frequency and intensity of tillage, landscape horticulturalists can help preserve SOC and maintain soil health. In other words, choose landscape construction and maintenance practices that are the least disruptive to the soil.
2. **Mulching:** but not necessarily bark mulch. Applying organic mulch, such as compost or wood chips, to the soil surface can help to increase SOC levels by providing a source of carbon and other nutrients for soil microorganisms. Mulch can also help to regulate soil temperature and moisture, reducing the need for irrigation and improving plant health.
3. **Composting**: composting organic wastes, such as leaves, grass clippings, and food scraps, can help to produce a nutrient-rich soil amendment that can be added to the soil to increase SOC levels and improve soil health. Or, better yet, leave the leaves! Instead of changing the aesthetic of a garden by "cleaning up" or removing leaves, flowers, or debris in a fall clean-up, consider educating the clients to help change their perception of what a healthy garden is and does for the ecosystem.
4. **Planting cover crops:** cover crops, such as legumes, grasses, and clovers, can help to improve soil health by fixing nitrogen, reducing erosion, and adding organic matter to the soil. For example, if a

landscape project is scheduled over a long period of time, consider planting a cover crop to avoid bare soils that are prone to erosion.

5. **Integrated Pest Management (IPM):** using IPM practices, such as physical, cultural, and biological controls, can help to reduce and ideally eliminate the use of synthetic pesticides and fertilizers, which can have negative impacts on soil health and SOC levels.
6. **Leave the leaves:** changing the way we perceive beauty in the landscape can have a significant impact on the carbon (re)entering the carbon cycle and regenerating soil carbon stores for microorganisms that break down the carbon into usable nutrients for plants to continue the cycle.

Overall, landscape horticulturalists can use a combination of these practices to improve soil health and SOC levels, which can lead to healthier plants, improved water quality, and healthier ecosystems. The nitrogen and carbon cycles and the process of photosynthesis are just a few examples from the harmonized landscape horticulture curriculum of how instructors can connect natural cycles and processes to sustainable landscape construction and maintenance practices.

To finish off this section of the chapter, we encourage you to watch the video below. The video reviews the carbon cycle but will help us transition into the next section of the chapter, alternative energy, which focuses on how technology can support landscape horticulturalists in making sustainable choices to reduce their environmental impact.

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"Healthy lawns and landscapes help fight climate change by sequestering carbon, creating oxygen, and saving energy by keeping you cooler in the summer and warmer in the winter. Landscape and lawn care professionals play an important role in caring for the backyards, parks, ballfields, and public green spaces that help the environment. Your yard and your landscaping can help fight climate change!" (National Association of Landscape Professionals, 2021).
Video credit: Healthy Lawns and Landscapes Fight Climate Change, (National Association of Landscape Professionals, 2021).

Teaching and Learning Examples for Instructors

- **Assignment:** Connecting Natural Processes to Landscape Maintenance Practices for Sustainability Note This assignment was created by Chatgpt, you can adapt it for your region and learners as needed.

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. In what ways do you currently connect natural processes to the curriculum you teach?
2. Do you think that students would be receptive to connecting natural processes to the horticulture skills and practices they choose to apply in the industry?
3. How can you help guide students to communicate natural processes and their impact on the horticulture skills and practices applied to clients?

Alternative Energy

Keywords: carbon footprint, purchasing locally, electric, solar, compass orientation (passive construction)

Reducing carbon dioxide (CO2) emissions is widely recognized as one of the most effective ways to adapt to and mitigate the challenges of climate change. Landscape horticulturists have more choices than ever before when it comes to selecting materials and equipment that can help reduce their **carbon footprint**.

Over the past few years, the horticulture industry has been undergoing a significant shift away from fossil-fuel-powered equipment and towards *greener* and more sustainable alternatives. Purchasing landscape materials from **local businesses**, and using **electric-powered** equipment is becoming increasingly popular, and **solar-powered** landscape lighting and onsite power sources are also gaining in popularity as horticulturalists seek to reduce their carbon footprint and contribute to a *greener* and more sustainable future.

Overall, the use of electric and solar-powered equipment can play an important role in promoting sustainability by reducing carbon emissions and reducing our reliance on fossil fuels.

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excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/facultytrainingmodulesforgreeningthelandscapetrade/?p=1281#oembed-1

"What exactly is the carbon cycle? Nathaniel Manning provides a basic look into the cyclical relationship of carbon, humans, the environment, and technology." Lesson by Nathaniel Manning, animation by Jill Johnston.
Video credit: The carbon cycle – Nathaniel Manning, (TED-Ed, 2012)

Selecting local materials for landscape horticulture can have several benefits.

1. **Reduce transportation:** purchasing local materials can reduce transportation costs and associated emissions, as materials that are sourced from far away require more fuel for transportation. By selecting local materials, horticulturalists can reduce their carbon footprint and contribute to a more sustainable future.
2. **Climate-adapted plant material:** local plant material is better adapted to the local climate and soil conditions, meaning plants are more likely to thrive and require less maintenance.
3. **Support the local economy:** selecting local materials can support the local economy by keeping money and jobs in the community.

Overall, selecting local materials can have both environmental

and economic benefits for landscape horticulture businesses and businesses that support horticulturalists doing their work.

The use of electric-powered equipment can contribute to greater sustainability in several ways:

1. **Reduced carbon emissions:** electric-powered equipment produces fewer carbon emissions compared to equipment powered by fossil fuels. This reduction in emissions helps to mitigate the impacts of climate change, which is a major threat to the sustainability of our planet.
2. **Noise reduction:** electric-powered equipment is generally quieter than equipment powered by fossil fuels, which can reduce noise pollution in communities and improve the quality of life for residents.
3. **Reduced reliance on fossil fuels:** electric-powered equipment can help reduce our dependence on fossil fuels, which are finite resources and contribute to air pollution and other environmental problems.
4. **Access to renewable energy sources:** electric-powered equipment can be powered by renewable energy sources, such as solar and wind power, which can help to further reduce carbon emissions and promote a more sustainable energy system.

The use of solar-powered landscape lighting and onsite power sources can help reduce the carbon footprint of landscape horticulturalists in several ways:

1. **Reduced reliance on fossil fuels:** by using solar energy instead of traditional electricity from the

grid, horticulturalists can reduce their reliance on fossil fuels and lower their carbon footprint.

2. **Lower greenhouse gas emissions:** generating electricity from fossil fuels produces greenhouse gas emissions, which contribute to climate change. In contrast, solar energy produces no direct greenhouse gas emissions, helping to reduce carbon footprints.
3. **Energy-efficient lighting:** solar-powered landscape lighting is typically more energy-efficient than traditional lighting, which can help reduce energy consumption and lower the carbon footprint of horticulturalists.
4. **Reduced need for grid electricity:** by generating their electricity onsite, horticulturalists can reduce their need for electricity from the grid, which is often generated from fossil fuels. This helps to further reduce their carbon footprint.

Technology and Digital Tool Use in Landscape Horticulture

Keywords: Technology, digital tools, reduce waste, business viability and operations, job tracking and scheduling, financial and digital literacy

Photo by StockSnap on Pixabay

Technology is a broad term that refers to the application of scientific knowledge to solve practical problems. It can refer to any tool or technique that is developed to make a task more efficient or effective. Technology includes a wide range of physical and digital tools, as well as methods and processes for using those tools.

Digital tools, on the other hand, are a specific type of technologies that are designed to operate in a digital environment. Digital tools are software applications or platforms that are designed to facilitate specific tasks or workflows. Examples of digital tools include project management software, communication tools such as email or text, and design software. While digital tools are a subset of technology, not all technology is digital. Some examples of non-digital technologies include irrigation systems, solar panels, and electric-powered equipment.

Technology plays a major role in increasing the sustainability of landscape horticulture businesses.

Advancements in technology can help horticulturalists **reduce waste, promote business viability, and increase environmental health.** For example, smart irrigation systems can use weather data and soil moisture sensors to optimize watering schedules, reducing water waste, and nutrient leaching and promoting healthier plants.

Drones can be used to map and monitor landscapes, allowing horticulturalists to identify issues and make targeted interventions, reducing the need for broad-spectrum chemical treatments. Electric equipment can reduce the need for gas-powered equipment, which as we know emit carbon. By harnessing the power of modern technology, landscape horticulturalists can increase the sustainability of their businesses and contribute to a more regenerative and sustainable future.

While **technology** has many potential applications in the horticulture field, our focus in this chapter is on technology and digital tools for teaching and learning to prepare students for diverse and changing roles in the industry. By incorporating technology and digital tools into teaching and learning, horticulture instructors can support student learning and, in turn, influence the horticulture skills and business practices students will take with them into the industry.

By using modern and innovative technology and digital tools such as job tracking and scheduling software or financial and digital literacy programs, landscape horticulturalists can reduce waste and promote environmental, economic, and social health, which can improve a business reputation and attract more clients who are interested in *greening* their practice.

In today's market, where sustainability and environmental stewardship are increasingly important to consumers, horticulturalists who prioritize these values can position

themselves for long-term success and viability. Ultimately, by using digital tools for *greening*, landscape horticulturalists can improve their business viability while also contributing to a more regenerative future.

To use digital tools, landscape horticulturalists need to be digitally literate to effectively and responsibly use digital technologies to access, evaluate, and communicate information. Digital literacy involves a range of skills, including the ability to use digital tools for tasks such as searching for information online, creating and sharing digital content, using social media, and communicating via email and other digital platforms.

Digital literacy also involves an understanding of the potential risks and challenges associated with digital technologies, such as online privacy concerns, cyberbullying, and the spread of misinformation. Digital literacy involves not only technical skills but also critical thinking and ethical considerations when using digital tools and platforms. In today's increasingly digital world, digital literacy is becoming an essential skill for participation in many areas of life, including education, work, and social interactions.

So, you are keen to try out a new technology or digital tool with your students, but you're not sure which one to choose. Below are some tools to help you choose which technology or digital tool is best to communicate the learning outcome to your students.

Ask yourself:

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This video explains the section's model, a decision-making tool to help instructors select technology and digital tools for their learners.
Video and image credit: The SECTIONS Model, Team 5 (Sarah, 2015)

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. What horticulture skills and practices do you think are important to support students with successful integration into diverse and changing roles in the horticulture industry?
2. What non-horticulture (soft skills and practices) do you think are important to include in horticulture training to support students with successful integration into diverse and changing roles in the horticulture industry?
3. What is your opinion on using technology and/or digital tools for teaching and learning in landscape horticulture? Do you think students need to use technology and digital tools to successfully integrate into the industry upon training completion?

4. What, if any, professional development do you need to seek out to effectively teach using modern technology and digital tools?

Regenerative Landscape: Restore and Regenerate

Regenerate (to renew/restore/respect)

Keywords: rain barrels, seed saving, restore, regenerate, reflect,

Regenerative Landscape Plan

Let's take a final look at the regenerative landscape design. This landscape design was approached through a regenerative and *greening* lens that embodies sustainability in multiple dimensions, encompassing economic, environmental, and cultural/social aspects.

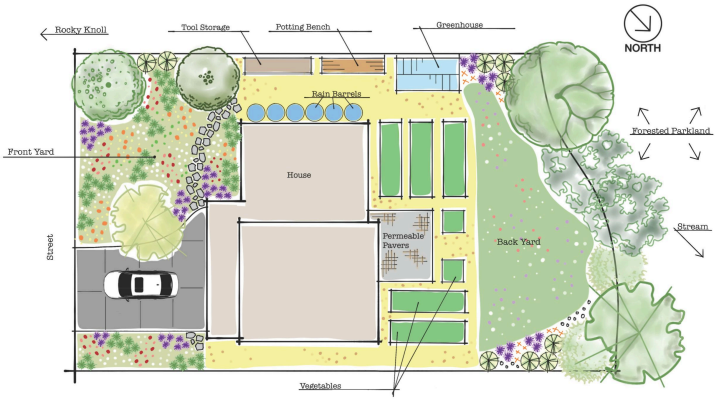
From an economic standpoint, the regenerative landscape proves *greener* and more sustainable by reducing long-term maintenance costs through the use of resilient and low-maintenance plantings, minimizing the need for costly inputs like pesticides and fertilizers. It also fosters local economies by promoting and purchasing plants and materials and supporting local businesses and artisans.

Environmentally, the regenerative landscape minimizes resource consumption and waste generation by incorporating principles such as water infiltration, soil regeneration, and biodiversity promotion. By restoring ecosystems and improving soil health, the regenerative landscape contributes to carbon sequestration and mitigates climate change impacts.

Culturally and socially, the regenerative design aims to honour stewards of the land and integrate elements that reflect

the region's rich traditions, such as the use of Indigenous plants and meadows, with the hope of creating a sense of place. It respects and enhances the natural beauty and ecological integrity of the landscape, fostering a deep connection between people and their surroundings. Of course, let's not forget about community building through shared seeds, fruits, and vegetables from the garden.

Overall, a landscape designed through a regenerative and *green* lens ensures sustainability by harmonizing economic, environmental, cultural, and social considerations, creating a holistic and resilient landscape that benefits both current and future generations.



The Regenerative Landscape Design

Reflect

Manfred Antranias Zimmer from Pixabay

Please use the following questions to guide your reflection:

1. Which topics were the most important to you? Which topics are the most approachable for you to integrate into your pedagogy and curriculum?
2. Can you design and propose a lesson plan, assessment, or learning activity that integrates the important topics into your pedagogy or curriculum?

A Final Thought

Photo by: Aaron Burden on Unsplash

Let's finish by looking back at the beginning.

This module was designed to prepare you to start a conversation in a meaningful and respectful way that encompasses the key topics presented in each chapter. Therefore, the final self-reflection opportunity asks you to initiate a conversation or design a lesson plan or learning activity utilizing the material and concepts explored throughout the chapters in this module.

These topics include, but are not limited to, greening, climate change, Indigenous knowledge and ways of learning, Two-Eyed Seeing, and the environmental, economic, and societal impacts of landscape horticulture. Through this final self-reflection opportunity, the hope is that you will be able to

demonstrate your understanding of the course material and your ability to effectively communicate about these important issues as they relate to the places you live in a way that is meaningful to you.

Here's what we recommend: start by identifying which of these topics are important to you, and start there. By starting with something that is familiar or that you are passionate about, you can build upon the foundation you already have to support your transformation. We encourage you to do your research, then reach out, speak with your colleagues, ask to speak with an Elder and honour their time, or find an authentic voice to enhance horticulture student learning.

We encourage you to be gentle with yourself as you explore new topics or ideas and approach them with humility and kindness. Please be kind to yourself and others as you feel the weight of this important work, and be mindful of your health and wellness.

Just like ours has been, your journey is your own.

As always, yours in teaching and learning.