

Farm Manager Certification Program

Section 3: Agroecology

Rev.: 1

Status: FINAL

Effective Date: 2022-06-01

SUMMARY

The Agroecology Knowledge Area for the Grow Calgary Farm Manager Certification Program includes the following tasks:

1	Identify beneficial pollinators in the area
2	Practice water conservation techniques
3	Reduce, reuse, recycle materials
4	Preserve the environment by minimizing the farm's impact
5	Identify local ecology - sharing land and water
6	Sustainability, biodiversity and ecological benefits of small scale agriculture



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1 PURPOSE

This document outlines the Agroecology Knowledge Area for the Grow Calgary Farm Manager Certification Program. This section has been developed to allow participants to understand how small scale agriculture programs can be sustainable, promote biodiversity and provide ecological benefits to the surrounding area. Agroecology has been practiced for thousands of years by Indigenous peoples and the techniques we use today in small-scale agriculture are all derived from the teachings of Indigenous land stewards.

2 DEFINITIONS

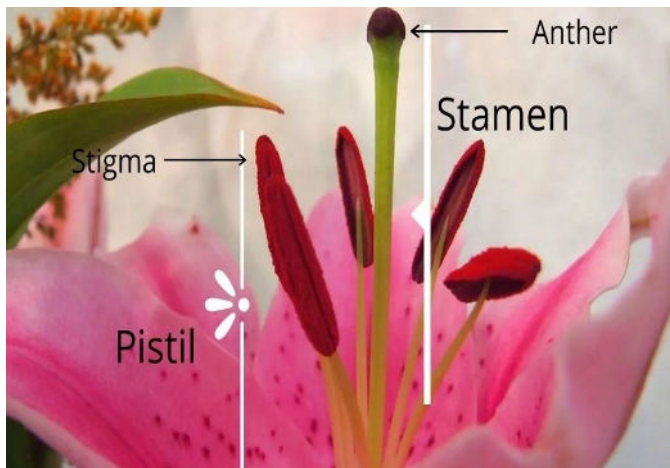
Pollination

Method of how plants and flowers reproduce and obtain the ability to grow seeds. Involves the transfer of pollen (a grain-like substance that contains the “male” gametes) from one flower to another, usually facilitated by other sources, whether abiotic (wind, rain) or biotic (animal dispersal). Some plants are able to self-pollinate, or hybridise with another species to create new subspecies of plants.

Drip Irrigation

Type of micro-irrigation system that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The goal is to place water directly into the root zone and minimize evaporation.

3 LEARNING OUTCOME NO. 1: IDENTIFY BENEFICIAL POLLINATORS IN AREA



What is pollination?

Flowers create pollen and use this to make seeds. Pollen is made in the anther of the stamen, the male part of the flower.

It needs to be moved from the stamen to the female part of the plant, the stigma in the pistil, in order for pollination to occur. Once this happens, the pollen can then be used to make seeds which enables the plant to reproduce or form fruit.

How does the pollen move from the stamen to the pistil?

Most often it is carried from plant to plant by small animals. Plants use sweet scents, bright colours and the lure of sweet nectar to lure pollinators in. In the process, pollen sticks to the animal’s fur or skin. Over 75% of flowering plants require pollination. Bees, bats, birds, beetles and other small animals and insects are pollinators. Less frequently, pollen is carried in the wind. If there were no insects, plants would have to rely on unpredictable winds for reproduction.

Why are pollinators important?

Pollinators contribute to every 1/3 bites of food humans consume. Most of the fruits, vegetables and nuts that make up our diets require pollinators.

Without pollinators, most of our trees and plants would not be able to reproduce, resulting in less habitat for wildlife, fewer natural resources and less diverse environments. It is important to establish farming practices that promote a supportive ecosystem for pollinators.



How to support a healthy environment for pollinators?

One of the most effective ways to increase local pollinator numbers is to increase the flowers available to them. Another way is to have hives on the farm. Grow Calgary currently has 2 hives on the farm, which are managed by our beekeeper.

To attract an array of pollinators, plant a diversity of flower species that:

- have flowers ranging from open and shallow to deep and complex;
- have different colours, heights and growth habits;
- provide good pollen and/or nectar resources
- exhibit overlapping bloom periods from April to October.

Native Alberta plants that attract pollinators are as follows:

EARLY SPRING to EARLY SUMMER			
Chives	Clarkia	Clover	Dianthus
Larkspur	Lupine	Osteospermum	Pea
Poppy	Alyssum	Viola	
MID-SEASON			
Basil	Black-eyed Susan	Galliardia	Asclepias
Caleundula	Echinacea	Cosmos	Feverfew
Foxglove	Hollyhock	Mondarda	Squash
Pumpkin	Thyme	Coreopsis	Yarrow
Verbena	Petunia	Nasturtium	Snapdragon
LATE SEASON			
Asteres	Canada Goldenrod	Cleome	Marigold
Sage	Scabiosa	Sunflower	Zinnia

4 LEARNING OUTCOME NO. 2: PRACTICE WATER CONSERVATION



Farming is a fairly water intensive activity. With increasing strains on water supplies and access to water it is important to conserve as much as possible. For instance, using rain barrels to catch rainwater and mulching.

What are the most effective ways to conserve water?

Outlined below is a list of the water conservation techniques used at Grow Calgary:

- A. DRIP IRRIGATION:** DRIP IRRIGATION DELIVERS WATER DIRECTLY TO A PLANT'S ROOTS, REDUCING THE EVAPORATION THAT HAPPENS WITH SPRAY WATERING SYSTEMS. DRIP IRRIGATION CAN SAVE UP TO 80 PERCENT MORE WATER THAN CONVENTIONAL IRRIGATION, AND CAN CONTRIBUTE TO INCREASED CROP YIELDS. AN EXAMPLE OF THIS IS THE GARDEN MOUNDS USED FOR POTATOES AND SQUASH.
- B. ASSESS THE WEATHER:** LOOK AT THE WEATHER FORECAST BEFORE WATERING. IF ENOUGH RAIN IS FORECAST IN THE COMING DAYS, YOU CAN AVOID WATERING.
- C. ASSESS THE SOIL MOISTURE:** UTILIZING TOOLS SUCH AS A MOISTURE METER CAN HELP TO DETERMINE THE WATERING LEVELS REQUIRED FOR THE SOIL. YOU CAN ALSO ASSESS BY FEELING THE DAMPNES OF THE SOIL.
- D. CAPTURING AND STORING WATER:** MANY FARMS RELY ON MUNICIPAL WATER OR WELLS (GROUNDWATER), WHILE SOME HAVE BUILT PONDS TO CAPTURE AND STORE RAINFALL FOR USE THROUGHOUT THE YEAR. PROPERLY MANAGED PONDS CAN ALSO CREATE HABITAT FOR LOCAL WILDLIFE. GROW CALGARY RELIES ON TWO PONDS, A WELL, AND LARGE RAIN BARRELS.
- E. COMPOST AND MULCH:** COMPOST IMPROVES SOIL STRUCTURE, INCREASING ITS WATER-HOLDING CAPACITY AND RETAINING NUTRIENTS. GROW CALGARY'S COMPOST IS MADE OF ORGANIC MATERIAL LIKE LEFTOVER FOOD, ANIMAL MANURE, STRAW, HAY, AND OLD MULCH. MULCH HELPS TO RETAIN WATER AND KEEPS IT CLOSER TO PLANT ROOTS. WE TYPICALLY USE HEMP MULCH AT GROW CALGARY. APPLY 3 OR 4 INCHES (8-10 CENTIMETERS) OF MULCH AROUND PLANTS IN THE GARDEN BEDS.
- F. DROUGHT-TOLERANT CROPS:** GROWING CROPS THAT ARE APPROPRIATE TO THE REGION'S CLIMATE IS ANOTHER WAY TO CONSERVE WATER. CROP SPECIES THAT ARE NATIVE TO ARID REGIONS ARE NATURALLY DROUGHT-TOLERANT, WHILE OTHER CROP VARIETIES HAVE BEEN SELECTED OVER TIME FOR THEIR LOW WATER NEEDS.
- G. ROTATIONAL GRAZING:** ROTATIONAL GRAZING IS A PROCESS IN WHICH LIVESTOCK ARE MOVED BETWEEN FIELDS TO HELP PROMOTE PASTURE REGROWTH. GOOD GRAZING MANAGEMENT INCREASES THE FIELDS' WATER ABSORPTION AND DECREASES WATER RUNOFF, MAKING PASTURES MORE DROUGHT-RESISTANT. INCREASED SOIL ORGANIC MATTER AND BETTER FORAGE COVER ARE ALSO WATER-SAVING BENEFITS OF ROTATIONAL GRAZING.

- H. **COVER CROPS:** PLANTED TO PROTECT SOIL THAT WOULD OTHERWISE GO BARE, COVER CROPS REDUCE WEEDS, INCREASE SOIL FERTILITY AND ORGANIC MATTER, AND HELP PREVENT EROSION AND COMPACTION. THIS ALLOWS WATER TO MORE EASILY PENETRATE THE SOIL AND IMPROVES ITS WATER-HOLDING CAPACITY.

5 LEARNING OUTCOME NO. 3: REDUCE, REUSE, RECYCLE MATERIALS



Every day and every season, Grow Calgary looks to improve the sustainability of the farm through practices such as reducing waste, reusing materials and recycling equipment.

With the majority of materials on the farm being donated, it is important to have a continued focus on maximizing the use of materials. Allowing the farm to be developed as efficiently and environmentally friendly as possible.

Reduce

Cutting back on unnecessary purchases or processes lowers the rate at which materials are used, and lowers the energy and transportation costs that are accrued when an item is made and sold. Using less water, landscaping to the local climate and replacing less efficient tools all fit under reducing.

Reuse

Reusing materials and using items that have reusable qualities. Reusing prevents waste and lowers the amount of energy needed to manufacture new products. Less pollution results, and more natural resources are left intact. When an item is reused, consumption is reduced as a by-product.

Recycle

Refers to the process in which an item or its components are used to create something new. Plastic bottles are recycled and made into carpet, pathways and benches. Glass and aluminum are other commonly recycled materials. Recycling is a form of reusing, but refers specifically to items that are broken down into raw materials. Composting is an effective way we recycle organic waste at the farm.

The aim on the Grow Calgary Farm is to minimize our waste as much as possible. This means finding creative ways to keep landscape and garden debris out of the waste stream.

a. Reduce

- I. Minimize waste by pruning shrubs, hedges and trees only when needed.
- II. Start seeds in recycled kitchen containers like toilet paper rolls, or yogurt cups.
- III. Use twigs, hemp, wood chips, and plant prunings instead of packaged mulch.

b. Reuse

- I. Use branches as plant protection during severe weather or create a brush pile as shelter for birds and small animals.
- II. Use pruned branches as plant stakes.

- III. Reuse plant trays and cups to grow seedlings for the following year.
- IV. Reuse donated items like the mushroom blocks as garden bed boundaries, pallets for fencing and shelving, and old structures as storage

c. Recycle

- I. Shred leaves, dead plants and prunings to use as mulch, or dig/mix them right into the soil for added nutrients.
- II. Use wood chips from local arborists as mulch and to cover mud roads.
- III. Put all leftover clippings, dead plants, and old mulch into the compost pile.

6 LEARNING OUTCOME NO. 4: PRESERVE THE ENVIRONMENT & MINIMIZE IMPACT

Outlined below are preservation methods that are used on the farm to preserve local ecology, create a sustainable farming environment and ultimately reduce our impact on the environment:

6.1 Develop A Management Plan

It is important to be aware of the current situation to improve any future outcomes. Having a sound management plan increases output, combats food insecurity, runs effectively, lowers operation costs, and reduces climate impact. Achieving a clear understanding of how the farm operates, reveals which areas it can run more efficiently while producing more food.

6.2 Improve Water Consumption

In 2020, agriculture accounted for 70% of all global freshwater withdrawals but climate change is causing water to become increasingly scarce. This is why we have multiple water sources and utilize each one depending on distance to plants and the amount of water remaining. Drip irrigation, compost, mulch, and capturing water are key strategies that we use to conserve water.

6.3 Focus on Soil

The soil is treated as if it were a crop. One practice that we use is carbon farming, which helps mitigate the effects of climate change. Through photosynthesis, plants act as carbon sinks to draw CO₂ out of the atmosphere. About 40% of that carbon is deposited into the soil, where it feeds microorganisms like bacteria, fungi, protozoa, and nematodes. These creatures give nutrients to the plants. We support this process by using compost and no-till growing. Fertile soil imparts better flavour and a higher nutritional value to food. Healthy soil also holds higher amounts of moisture, which helps to keep plant roots hydrated during dry periods.

6.4 Focus on Trees

Trees can act as windbreaks to reduce soil erosion, enrich the soil, filter and conserve water, provide shade, create habitat for wildlife, store greenhouse gasses, and so much more. Land management practices such as reforestation, restoring riparian zones, and planting hedgerows and perennial plants can provide shelter for wildlife, beautify farms, and attract insects for pollination and natural pest control.

6.5 Renewable Energy

Maximizing energy efficiency and shifting away from fossil fuels are important steps that farms can take to reduce their climate footprint. This can include on-farm renewable energy

production such as solar panels and wind turbines, and reducing dependence on fossil fuel inputs for farming, storage, and transportation of crops.

6.6 Organic Practices

The industrialization of agriculture has led to widespread dependence on petroleum-based pesticides, herbicides, and fertilizers in conventional farming. We do not use any pesticides or fertilizers at Grow Calgary, which means reduced GHG emissions, as well as cleaner soil, water, and food. Furthermore, organic and sustainable techniques bring additional benefits such as increased soil health and fertility.

6.7 Supporting Local Food Production

When farmers sell directly at markets or through other distribution channels, food is transported shorter distances, conserving those resources. We strive to supply as many local food access programs as we can at Grow Calgary, and are strong advocates for local food production and policy. Encouraging local food production and engaging with consumers is a huge benefit for communities. Supporting local food producers keeps farming viable, so that farmers can stay on their land and be successful growing food that sustains us while caring for the earth.

7 LEARNING OUTCOME NO. 5: LOCAL ECOLOGY

Ecology examines the relationship that living organisms have with their environment. In Alberta, the Dry and Central Mixedwood subregions cover nearly 40 per cent of the province. The vegetative communities in these subregions are important because they provide summer range for livestock, prime habitat for many species of wildlife, productive watersheds, recreational areas and timber production.

8 LEARNING OUTCOME NO. 6: SUSTAINABLE BENEFITS OF SMALL SCALE AGRICULTURE

Local, small-scale farms typically utilize more sustainable methods than conventional industrial farming to maintain soil productivity and control pests. Grow Calgary employs methods such as companion planting, no tilling, crop rotation, nutrient cycling (i.e. composting, mulching), biological pest control and fostered biodiversity.

8.1 Advantages of Small Scale Agriculture

Reduced Emissions from Transport: Food is currently produced and consumed on a corporate level, as well as transported intercontinentally. The way that food is being transported and subsequently wasted, is releasing tons of CO₂ into the atmosphere, which has caused mass destruction to the planet through climate change. This has put the ecosystem in danger and is affecting farmers through the changing weather patterns that bring about unusual weather that can destroy farmland and animals.

Food Quality: Locally grown fresh food is consumed almost immediately after harvest, so it is sold fresher and usually riper. Also, the need for chemical preservatives and irradiation to artificially extend shelf-life is reduced or eliminated, meaning food is more nutritious.

Polyculture and sustainable farming: Local food systems encourage multiple cropping, growing a wide variety of crops at the same time in the same place, as opposed to the prevalent commercial practice of large-scale, single-crop monoculture.

For example, companion planting where plants that benefit each other are grown together, and crop rotation reduces pests, while increasing yield. In an animal/crop system, the on-farm byproducts like manure and crop residues are used to replace chemical fertilizers, while on-farm produced silage and leguminous crops can feed some of the animals.

APPENDIX

What pollinators can be found in Alberta?

Outlined below is a list of the most common pollinators from the Canadian Wildlife Federation:

- a. **Bees:** The honeybee (*Apis mellifera*) is probably the first animal that springs to mind when you think of pollination. But there are several bees found in Alberta, such as the bumblebee, mason bees, bumble bees, polyester bees, mining bees, and leafcutter bees, that are responsible for spreading pollen from almost every single flowering plant.
Did you know that bees are an endangered species? They have been on the decline in many areas of the world, including AB, where records have shown a 40% decrease in colony populations in some areas (Edmonton Journal).
- b. **Hummingbirds:** These birds eat the nectar of tubular flowers. Pollinators in AB include the Rufous hummingbird and the Ruby-throated hummingbird. Hummingbirds use their long beaks to get the nectar of flowers, and are covered in pollen when they arrive at the next flower. Avoid pesticides and other chemicals, which kill spider populations that provide the spider silk for hummingbird nests.
- c. **Butterflies:** Butterflies are known as a sure sign of spring and our native species are great pollinators. Well-known pollinators include the Canadian Tiger Swallowtail, the Silvery blue butterfly, and the Monarch butterfly.
- d. **Moths:** AB is also home to one of the few moth species that do act as pollinators, named hummingbird clearwing moth (*Hemaris thetis*). This moth flies and feeds on flower nectar in the daytime, and mimics a hummingbird's flight and hovering behaviours.
- e. **Wasps:** There are many varieties of social vespids (like paper wasps, hornets, and yellowjackets) that are pollinators in addition to being aggressive insects. They aren't too aggressive, however, when they don't feel threatened and have plenty to eat. When planting to attract other pollinators, you'll attract wasps too, which helps our local ecosystem and keeps the wasp population content.
- f. **Flies:** Most flies are not pollinators, except for the hover fly. The hover fly is a bee or wasp imitator, it helps with managing insect populations with its predaceous larvae. They love wild roses.

- g. Beetles:** Some beetles are pollinators, landing on flowers and eating the nectar. The Checkered beetle helps with pollination, although its larvae are predatory and live in bee and other insect nests. Still, they are part of a healthy ecosystem.

Pollinator Quiz: <https://cwf-fcf.org/en/resources/games/quizzes/pollinator-quiz/>