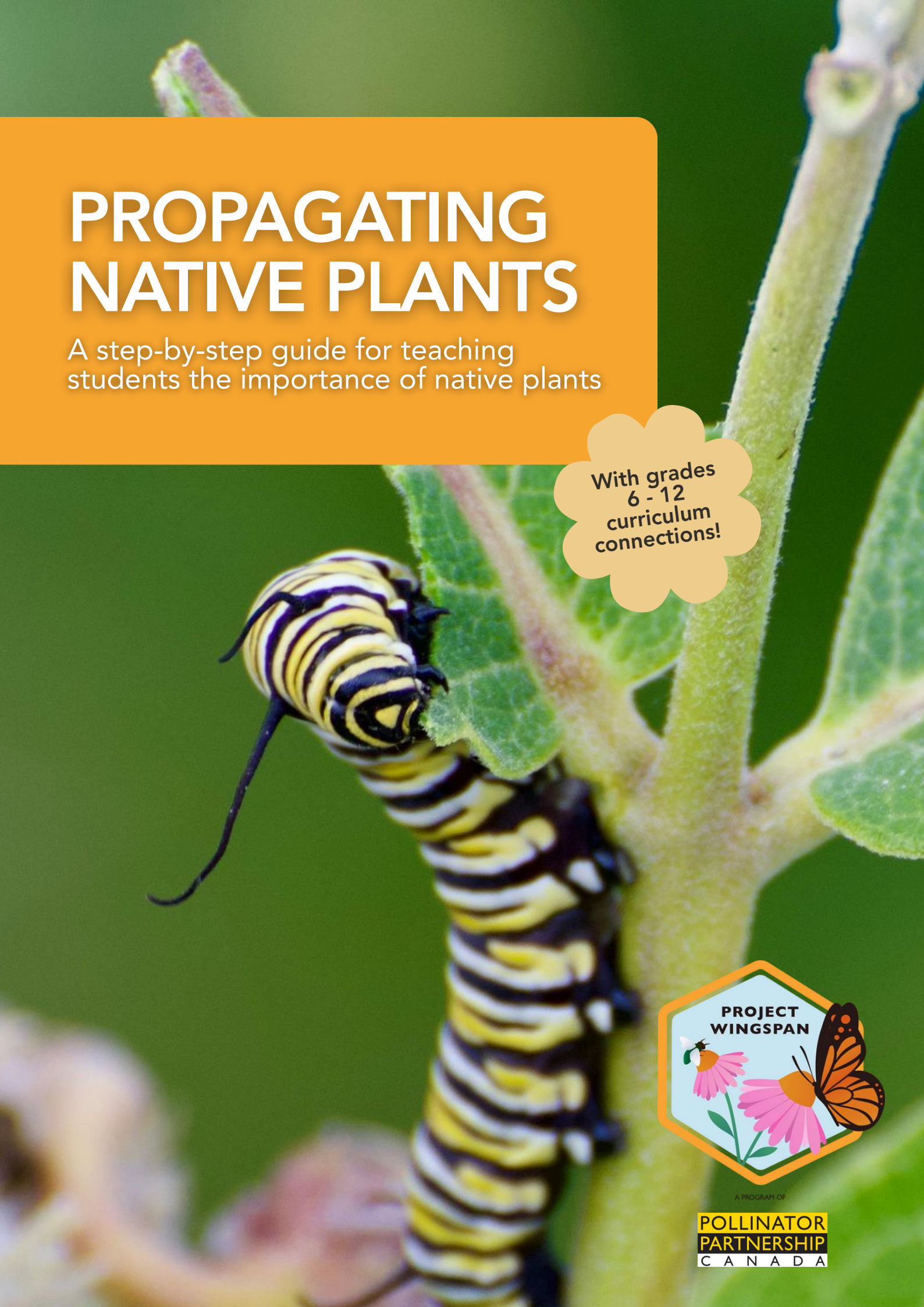
PROPAGATING NATIVE PLANTS

A step-by-step guide for teaching students the importance of native plants

With grades 6 - 12 curriculum connections!



PROJECT WINGSPAN

A PROGRAM OF

POLLINATOR PARTNERSHIP CANADA

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POLLINATOR PARTNERSHIP CANADA

PROJECT WINGSPAN

Why native plants?

How Learning about Native Plants Benefits Students:

Growing plants by seed in the classroom provides many learning opportunities for students. When students see plants grow, they connect observational experiences to what they're learning about: the germination process, plant life cycles, and plant growth needs. This experience can give students feelings of responsibility and excitement as they observe changes from day to day. To grow a plant from seed teaches patience, rewards care, and provides a positive psychological experience when we engage with nature by witnessing seedlings sprout.

Beyond just observing any plant, **native plants help students learn about local ecosystems and the value of protecting native flora and fauna.** This includes highlighting what ecosystem functions/services native plants offer which introduced species do not. Native plants support native pollinators including over 4000 species of native bees across North America. Additionally, native plants support and are supported by other pollinators like flies, wasps, beetles, butterflies, and moths in Canada. Some of these beneficial relationships are specialized with plants co-evolving with specific pollinators.

Some examples include the famous monarch butterfly (*Danaus plexippus*) and milkweed species (*Asclepias spp.*); spicebush swallowtail (*Papilio troilus*) and Northern spicebush (*Lindera benzoin*); and columbine duskywing (*Erynnis lucilius*) and wild columbine (*Aquilegia canadensis*). These plants act as food for the caterpillars and adults of these butterfly species and in return can be pollinated by them. Native plants and insects interact and support each other in many different ways.

In **Curriculum Connections**, we outline specific examples for talking points, but growing native plants also provides benefits outside of the classroom! It creates and enhances existing habitat for pollinators of all kinds, increases biodiversity in the area (especially in urban areas where there are many ornamental, introduced species), and helps to cultivate and strengthen community around the school. In the section **"What's Next?"** we share some ways to bring community into schools through this project. By growing native host plants and food sources for pollinators, you and your class contribute to a growing number of pollinator protectors across the country. To grow native plants is to be a steward of nature, to give back to the land, and to respect the natural world.

Materials & Plants

List of Materials

Go to the Appendix for example images for each method!

- [ ] **Native Plant Seeds**
- [ ] **Potting Soil**
- [ ] **Tray-like containers. (1-3 inches deep)**
  - We encourage the use of recycled materials!
  - Is there anything students have access to that can be used?
- [ ] **[For outdoor trays] Chicken wire (1/2" mesh), and burlap or leaves collected from your yard**
- [ ] **Pots (~10 cm deep)**
  - For both trays and pots, any container will work!
  - Reduce both waste and classroom costs by reusing takeout food containers, coffee cups, and anything else you can think of!
  - Collect materials while you wait for the seedlings to grow.
  - Be sure to drill/punch drainage holes in the bottom!

Materials & Plants

What Plants to Use:

The plants you decide to use should be native to your specific area. These plants are specifically evolved to thrive in harmony with other plants and animals nearby. Always research plants that are native in your region.
Visit Pollinator Partnership Canada's Ecoregional Planting Guides and Find Your Roots Tool to help select your plants (see Resources).

Some sample plants that are native across much of Canada:

Canada anemone (*Anemonastrum canadense*)

Black-eyed Susan (*Rudbeckia hirta*)

Canada goldenrod (*Solidago canadensis*)

Anise hyssop (*Agastache foeniculum*)

Common milkweed (*Asclepias syriaca*)

Consider the growing conditions of the place plants might be planted into after they sprout. For example, you wouldn't want to grow a plant like marsh marigold (*Caltha palustris*) if you plan on putting it in a dry area. It's also important to consider things like height and blooming season.

Bear in mind which seeds need cold stratification and the duration that they require (for more information see Resources). Some species involve germination processes that are not covered in this guide, so always check requirements before selecting plants.

METHOD 1: OUTDOORS

1. **This process can be started between November and February**

2. **Fill trays with soil.**
   - Ensure trays have plenty of drainage holes. If not, make your own.

3. **Place seeds in trays and cover lightly with soil.**
   - Bear in mind that in nature they are simply tossed anywhere!
     Be generous with the amount of seeds sown as not all will germinate.
   - Label trays with what species are being grown.

4. **Cover with burlap, or autumn leaves and chicken wire so seeds are not blown away or eaten by birds or rodents, but still allow water and snow to reach the soil.**
   - One method is to create an insulating layer of leaves over the soil and below the chicken wire. This prevents seed from blowing away, reduces wildlife interactions, and allows seedlings to grow through the insulating materials with ease. The smaller the holes in the chicken wire/mesh, the better to deter wildlife!
   - For higher success in germination, **avoid** using leaves from these tree species: Oak (leaves are slow to decompose, making it hard for seedlings to poke through), Beech (ok in small quantities, see oak), Black Walnut (juglone, a chemical in the leaves, is a natural growth inhibitor), Buckthorn, and some evergreen needles.

Notes:

You can also direct sow native plant seeds in a prepared bed just before the first snowfall!

METHOD 1: OUTDOORS

5

Leave trays outside and wait!

Let nature take its course by allowing snow and rain to fall on the seeds.

- As seasonal winter norms shift, you will want to periodically check on your seed trays. If trays are exposed to the elements on a sunny/warm winter day, you may want to shovel snow over your trays to ensure adequate insulation throughout the winter season. This prevents immature germination, or damage to seedlings in unusual/extreme weather.

6

By April and May, seeds should be sprouting.

- If using burlap, remove this layer as soon as you see sprouting plants with leaves. Continue protecting your plants with chicken wire.
- If using leaves, you can remove some or all of the leaves in May, but it may not be necessary. Many seedlings will be successful growing through the leaves, and they provide protection from uncertain weather in the early stages of a seedling's life.

7

Once plants begin to reach around 7 cm tall gently separate them from the tray, placing each in individual pots that are about 10 cm deep. After a brief period of adjustment, plants are ready to continue growing, or be planted!

Notes:

METHOD 2: FRIDGE

1. **Start in March or April.** *You don't want plants popping up too soon when they can't survive outdoors!*

2. **Place seeds in a closed container either on moist soil or wrapped in a slightly moist paper towel.**
   - Bear in mind that in nature they are simply tossed anywhere! Be generous with the amount of seeds sown in soil as not all will germinate.
   - Label trays with what species is in each.

3. **Place in the fridge for 6-8 weeks.**

4. **Check in on your plants!** *Occasionally mist with a spray bottle to keep moist but do not overwater. Take out moldy pieces as needed.*

5. **As you wait, collect pots and containers to put the plants in when they grow.**

Notes:

METHOD 2: FRIDGE

6 **After appropriate time in the fridge, seeds can be taken out and placed in a warm, bright place. In this warmth, the seeds will continue to germinate and begin to sprout.**

- If there is a greenhouse at school, this is the perfect place for them as they grow.

7 **Towards mid to late May, or at least past the last frost date, seedlings can begin to go outside during sunny days.**

- You must transition to outdoor growing conditions using a process called hardening off. Start with seedlings in indirect light and low wind for a few hours a day, and work your way up to all day outside in the preferred growing conditions of that species. During this period, check in on plants often--they need more watering.
- After hardening off, plants can be left outdoors.

8 **As plants begin to reach around 7cm tall,** gently separate them from the tray and place them in individual containers that are around 10cm deep. **The plants are ready to be given out and planted!**

Notes:

Curriculum Connections

How might native plants connect to topics such as Indigenous/Canadian Studies, Geography, Business Studies, Math, Visual Art, and Careers? There are many opportunities to discuss native plants through cross-curricular and integrated learning. Below, we outline specific links in science and biology courses, environmental science courses, and upper year green industries courses.

Environmental Science:

- Native plants serve as a gateway to discuss habitat loss and issues facing local flora and fauna.
- Topics can include the role of ecosystems—such as trees, prairielands, and mosses—in absorbing carbon and the importance of native bees in pollinating a third of our food supply.
- It's essential to highlight how individual actions, along with regulatory and commercial decisions, can positively or negatively impact the environment.

Discussion prompt: What steps can students take after growing native plants to support pollinators and act as environmental stewards?

Social Studies

- In social studies, planting pollinator gardens can link to conversations about community activism and social justice.
- Gardens contribute to community autonomy over food, medicines, and resources, promoting equitable access.

Discussion prompt: List some of the significances of plants locally and globally. How could people and community develop a deeper connection with nature and their local land?

In short, growing seeds is related to fundamental concepts such as:

- Ecosystems and interactions
- Sustainability and stewardship
- Structure and function - Looking at how native plants adapt to local landscapes and differ from non-native plants
- Ecosystem equilibrium
- Human impact on the environment
- The crucial role of the sun

Curriculum Connections

Connections to Ontario Elementary School Curriculum

Grade 6 Science - Biodiversity

- Benefits and consequences of changes in biodiversity
- Local issues could involve learning about local restoration projects from Conservation Authorities or another group in your area
- See our Bee City resources on how flowering plants support pollinators which in turn support plants, food production, and human wellbeing

Grade 7 Science - Interactions in the Environment

- Abiotic conditions in the environment break seed dormancy and tell seeds when to start germinating so they are not killed by frost
- Plants grown indoors need hardening-off so they can acclimate and are not shocked by a quick transition to outdoor growing conditions.
- Succession and seeds germinating after fire
- Nutrient and water cycling involves plants

Grade 8 Science - Cells

- Cellular processes in plants during germination
- Different size seeds have different amounts of starch and can be planted at different depths
- Cell division as plants grow
- Anatomy and terms like, vacuoles, cell walls, stomata, transpiration, and vascular bundles

Curriculum Connections

Grade 9 Science - Biology: Sustainable Ecosystems

- When looking at the impact of human actions, you can discuss restoration projects and how fire was traditionally used by Indigenous communities to manage forest and prairie ecosystems and how removal of traditional fire regimes created a fuel load allowing for more expansive wildfires.
- Domination of grasses in prairie habitats and how fire regimes can maintain prairie and prevent succession of forests in an area, sometimes also breaking seed dormancy
- Invasive species, wildflower plantings adjacent to agricultural fields.

Grade 10 Science - Biology: Tissues, Organs, and Systems of Living Things

- Meristematic development of a plant and the specialization of organs and tissues
- Establish links between aboveground and belowground systems in plants: leaves produce sugar and starch, send it down to roots or use it to build new leaves and flowers, etc.

Grade 11 Biology

- In the "Plants: Anatomy, Growth, and Function" unit there are opportunities to discuss plant anatomy function and adaptations to different environments.
- In the evolution unit, discuss how plant breeding for agriculture (human-mediated genetic change from one generation to the next) has selected plants that don't have seed dormancy since humans are choosing when seeds enter the ground.

Grades 11 and 12 Green Industries & Careers

- Learning how to propagate and select plants based on the conditions in which they'll flourish is a big part of horticulture and landscaping.
- Highlight seed orchards as a way to increase native plants availability.
- Opportunities to learn about careers in native plant propagation and ecological restoration.

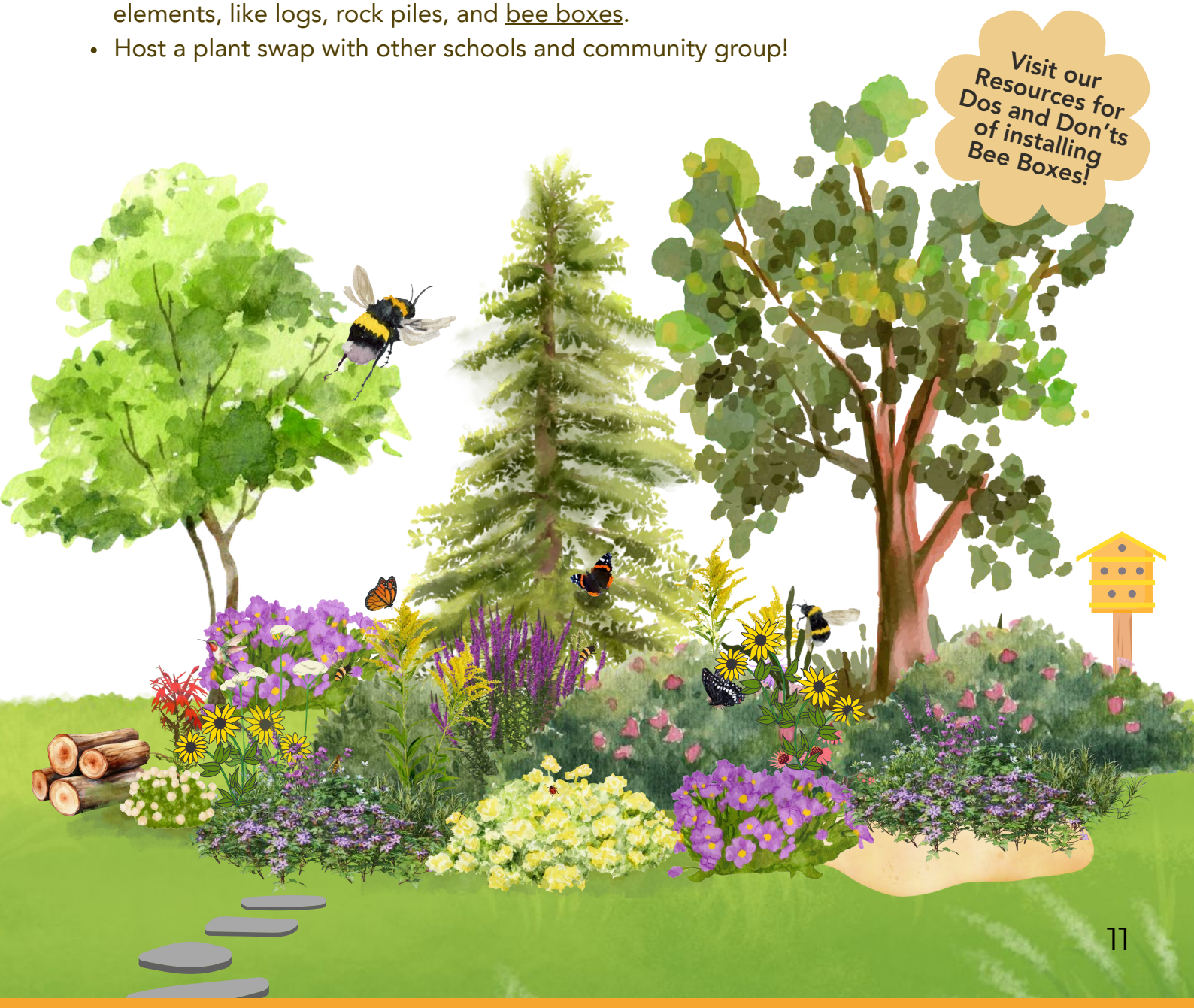
Grade 12 Biology

- Link seed dormancy and plant development to different aspects in the Biochemistry, Metabolic Processes, and Molecular Genetics units.
- Population Dynamics - Increased consumption of resources and production of waste associated with population growth result in specific stresses that affect Earth's sustainability.
- Technological developments can contribute to or help offset the ecological footprint associated with population growth.

What's Next?

After you have potted the seedlings and they have grown taller, you can begin thinking of what to do with all of these plants! There are many options available to you, depending on the amount of seedlings you have:

- Plant seedlings around your school and create habitat for pollinators by adding elements, like logs, rock piles, and bee boxes.
- Host a plant swap with other schools and community group!



What's Next?

What makes a good pollinator garden?

Healthy pollinator habitats have a diversity of plants available for nesting, shelter, and feeding throughout the season, as not all plants provide all of these services.

Plan for blooms throughout the growing season by utilizing **the 3x3x3 rule of gardening**: pick a few species of native plants that bloom in each of **Spring, Summer, and Fall**, and plant at least **three individual plants of each species.**

It is ideal to have a variety of plants with different **heights, colours, and non-herbaceous types**, such as trees, shrubs, and native grasses, although tnot necessary.

Patience is key – native plants often take about 3 growing seasons to flourish. We call this "Sleep, Creep, Leap!"

- **Year 1:** Sleep - Plants are focused on root growth. You will see some foliage and some flowers.
- **Year 2:** Creep - Plants focus more energy on foliage growth, expanding the area they take up. You will see more flowers blooming.
- **Year 3:** Leap - This is the year you are likely to see the most blooms. Spaces between plantings in your garden will have filled out substantially.

What's Next?

What makes a good pollinator garden?

Seedlings may not bloom in their first year, or even their second. They also require a bit more care for the first year, with watering and a bit of weeding. After the first year of establishment, they should be strong enough to make use of rainwater, and be resilient amid drought.

Using native plants as groundcovers like wild strawberry (*Fragaria virginiana)*, woodland strawberry (*F. vesca*) or silverweed (*Argentina anserina*) can assist you – reducing weeding and watering, while providing blooms during the spring season.

Top photo: Wild Strawberry - Bottom-left photo: Woodland Strawberry - Bottom-right photo: Silverweed

What's Next?

What makes a good pollinator garden?

Creating a garden on school grounds is an excellent way for students to enjoy and celebrate their efforts. Students will get to appreciate it year after year, and the garden can act as a living example for future students completing the same project. Passionate students, educators, or parents could form a club, tending to the space over the years.

Tip: Beginning the process in grade 9 can be rewarding if a unit in grade 10 ties into the previous year's exploration/experiment!

Have extra plants? Host a giveaway or plant sale!

A giveaway or plant sale can act as opportunities for fundraisers and community connection. These events will build community in your school and allow native plants to be shared throughout the neighbourhood. This enables native pollinators to have easier access to food sources, as they do not travel far.

By speaking with community members or peers about the importance of native plants during an event, students' learning is affirmed and solidified and the neighbourhood becomes a richer place as that knowledge is shared!

Glossary

Bet-hedging:
A population-level survival strategy for randomly varying environmental conditions. An example of bet-hedging would be variation in seedling germination timing even when exposed to ideal conditions. This can allow some seeds to germinate later within the season to avoid spring frost or in even following years to avoid drought years.

Dormancy:
The state a seed is in when a healthy seed is unable to germinate. Dormancy often prevents seeds in temperate regions from germinating before winter.

Ecosystem:
A complex community of plants, animals, fungi, humans, and other environmental factors which interact in the same space.

Germination:
The process of a seed turning into a plant.

Hardening off:
A gradual process of slowly exposing plants to outdoor growing conditions after being grown indoors so they can acclimate.

Herbaceous:
Plants without woody stems (like trees and shrubs). Most flowers are herbaceous.

Invasive:
A non-native plant that is aggressive towards other plants, spreads and takes over an area, and out-competes for space and nutrients. Typically these are not encouraged to plant.

Glossary

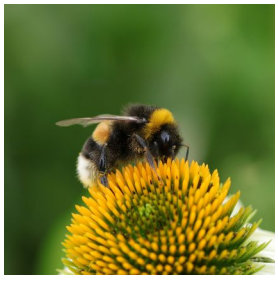
Non-native:
An umbrella term for all plants that have been introduced to an area where they are not native to. This is a neutral descriptor, and it is okay to have introduced species in a garden, as long as it is not invasive!

Pollination:
The process of spreading pollen from the male flower to the female flower for fertilization. Can occur through wind or water but the majority of flowering plants require animal pollination.

Seed Stratification:
Refers to the process of breaking seed dormancy. There are different needs for different seeds, such as cold/warm temperatures, or moist/dry storage. *Some seeds need to be scarified to break dormancy, which is a different process.*

Stewardship:
The practice of taking care of the Earth as the Earth takes care of you. There is not a strict definition or any rules attached to this, it is a mindset of minimizing harm to the environment.

Temperate Wildflowers:
Herbaceous (non-woody) flowering plants growing in temperate zones (between the tropics and the poles). Over 90% of temperate wildflowers have some form of seed dormancy.



Useful Links

About pollinators:

Bee City Canada:

- **Resources -** beecitycanada.org/pollinator-resources
- **Activity Booklets -** beecitycanada.org/pollinator-resources/kids-corner
- **Webinars** - beecitycanada.org/buzz-webinars

Installing Bee Boxes - Dos and Dont's - pollinatorpartnership.ca/en/bee-boxes

Selecting plants:

Native Plants Finder - pollinatorpartnership.ca/en/find-your-roots

Ecoregional Planting Guides Canada - pollinatorpartnership.ca/en/ecoregional-planting-guides

Growing native plants from seed:

Project Swallowtail Seed Sitters - pollinatorpartnership.ca/en/project-swallowtail/seed-sitters

Growing Native Plants from Seed - sayehsunstudio.com/2020/01/01/growing-native-plants-from-seed

The KISS Principle – Winter Sowing 101 - peterboroughmastergardeners.com/2022/12/26/the-kiss-principle-winter-sowing-101

Garden Fun Club - Educational Guide: sayehsunstudio.com/wp-content/uploads/2021/02/The-Garden-Fun-Club-Program.pdf

Where to purchase seeds/plants and organisations to connect to:

Prairie Moon Nursery - prairiemoon.com

Ontario Plants - onplants.ca

North American Native Plant Society - nanps.org

NANPS Seed Exchange - nanps.org/nanps-seed-exchange

Toronto Seed Library - torontoseedlibrary.org

Your local seed library!

Other resources:

Make Compost from Yard Waste - pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/426/426-703/SPES-393.pdf

How to Make Leaf Mould - rewildingmag.com/how-to-make-leaf-mold/

Pollinator Partnership Canada website

Appendix A

Outdoor Seed Starting

Example of setting up a seeded tray for outdoor stratification, and the end result. Note the use of recycled materials. Photos by Project Swallowtail member and Seed Sitter, Danielle.

Appendix B

Seed Starting - Fridge Method

There are many ways to germinate seeds using the fridge method, this is one example. Note the use of recycled materials.

Seeded tray in the fridge.

First day out of the fridge

One week out of the fridge

Appendix C

Potting up Plants - Outdoor + Fridge Method

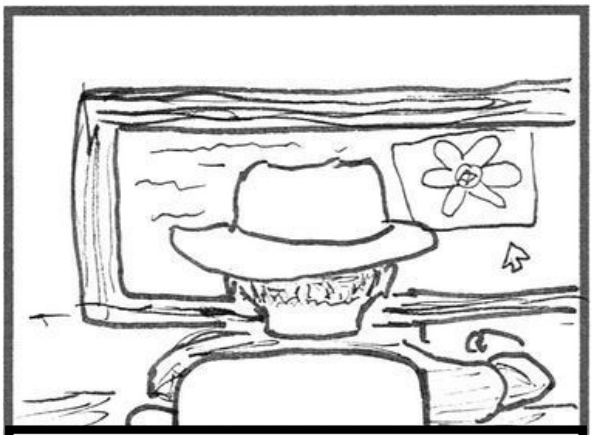
Below are some photos of the process of potting up plants

Image of a tray full of seedlings and the progress of potting up!
There were about 70 seedlings in this tray.

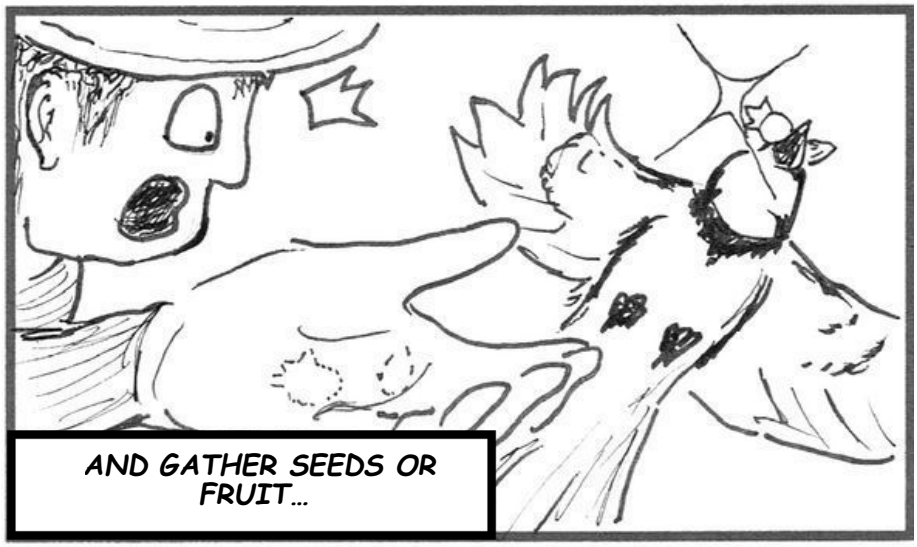
The same swamp milkweed (*Asclepias incarnata*) plants, now potted up.

GROWING TEMPERATE WILDFLOWERS & DEALING WITH SEED DORMANCY: A SHORT HOW-TO

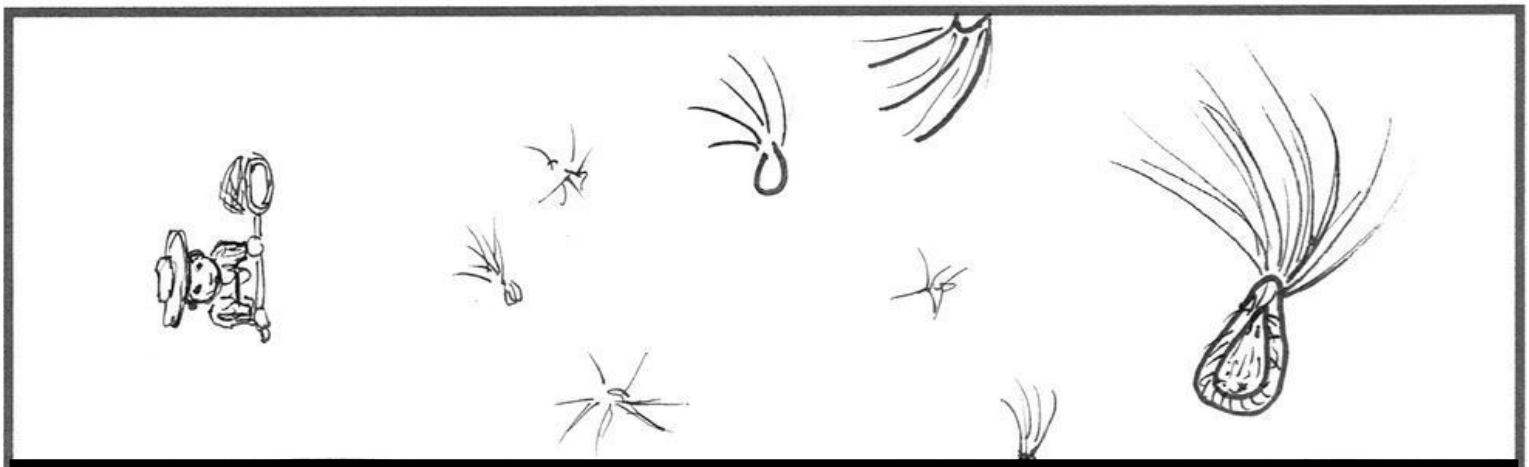
BY: GAVIN HOSSACK



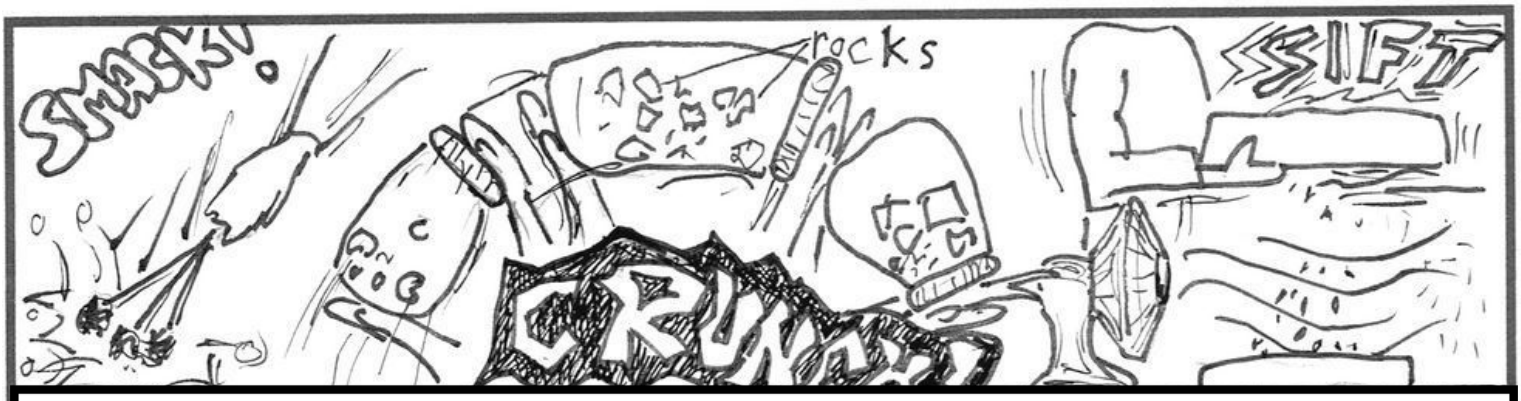
TO GROW WILDFLOWERS, IDENTIFY WHAT PLANTS YOU'D LIKE TO GROW…,



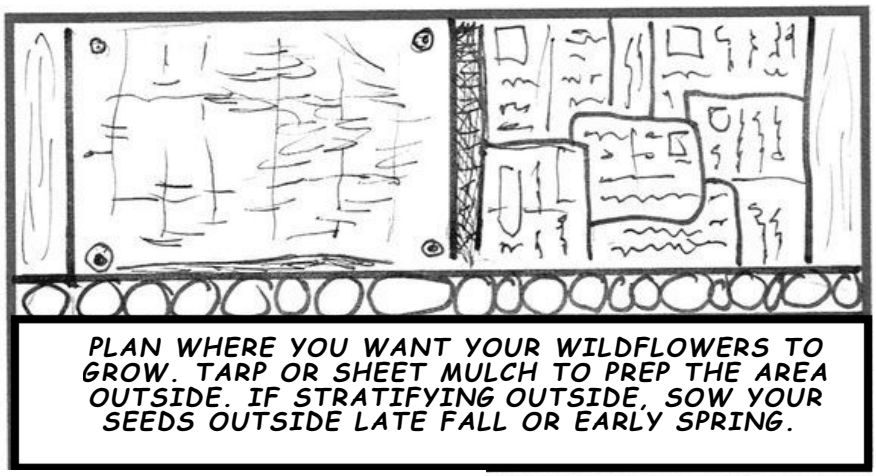
AND GATHER SEEDS OR FRUIT…



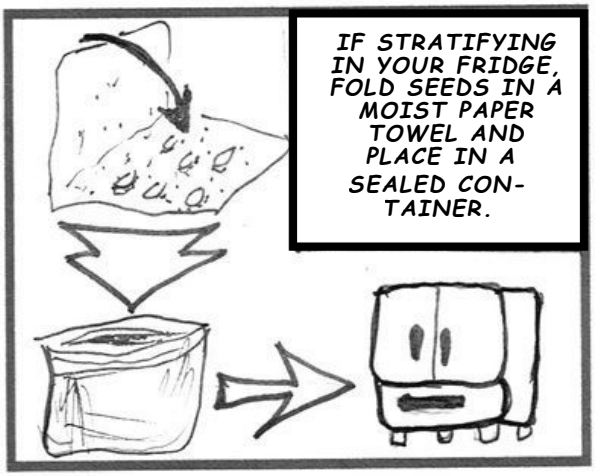
…PREFERABLY, BEFORE THEY DISPERSE.

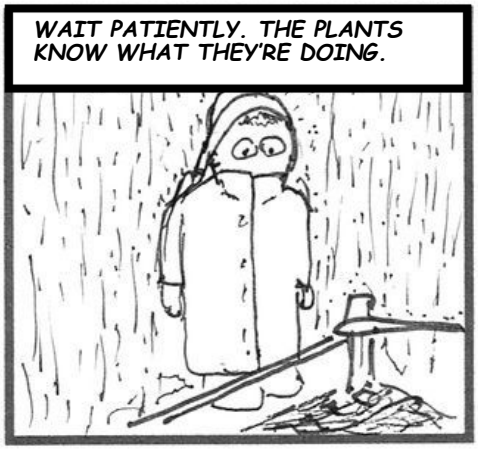


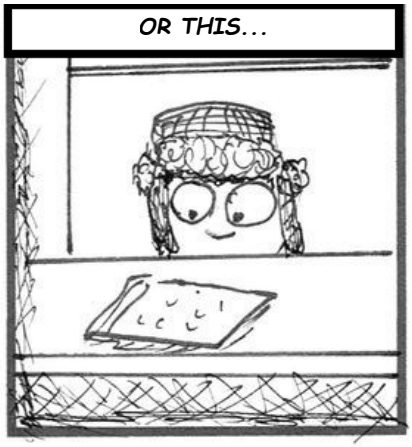
THRESH, SCREEN, AND WINNOW PLANT MATERIAL AS NEEDED TO EXTRACT THE SEEDS. THIS MAY INVOLVE SMACKING, CRUSHING, AND SHAKING MATERIALS TO BREAK SEEDS FROM PLANT PARTS; SIFTING TO SEPARATE PIECES BY SIZE; AND WIND TO REMOVE PIECES LIKE CHAFF BY WEIGHT.

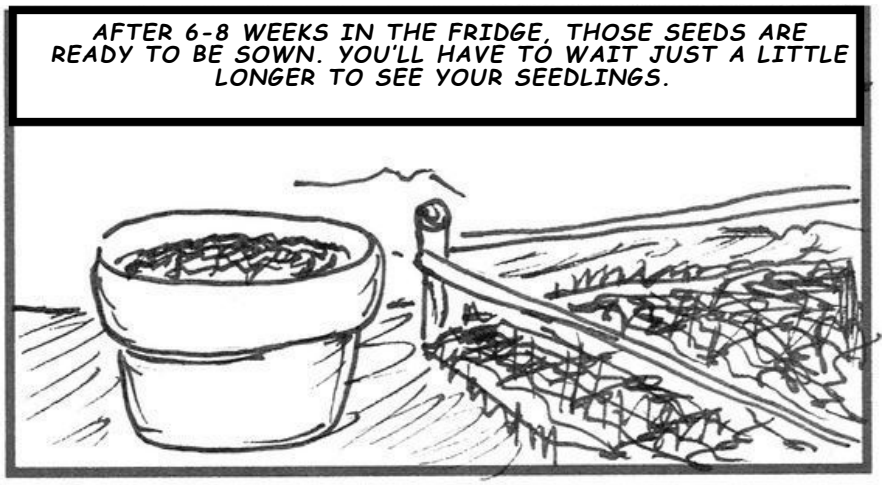


PLAN WHERE YOU WANT YOUR WILDFLOWERS TO GROW. TARP OR SHEET MULCH TO PREP THE AREA OUTSIDE. IF STRATIFYING OUTSIDE, SOW YOUR SEEDS OUTSIDE LATE FALL OR EARLY SPRING.









THE END

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PROJECT WINGSPAN

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