Growing Groceries

Presented by Washington State University King County Master Gardeners

Beyond the Basics: The Art and Science of Seed Starting

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WASHINGTON STATE UNIVERSITY EXTENSION

Master Gardener Foundation of King County

1

Notices

Master Gardeners provide a multitude of resources for home gardeners. This gardening information is research-based, available to the public, and focused on environmentally friendly and sustainable gardening practices.

2

Agenda

1 Equipment

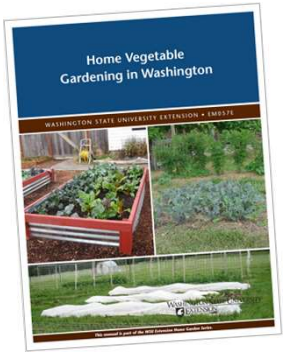
2 Mediums

3 Seeds

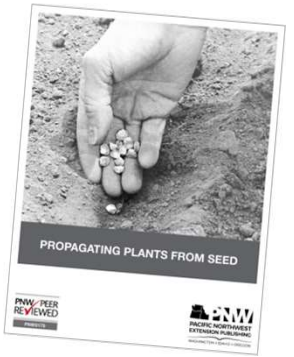
4 Growing

3

WSU Publications



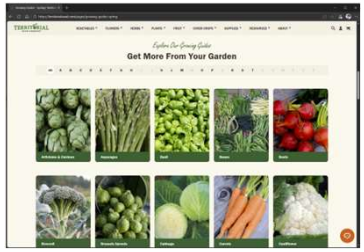
Look for **EM057E** on https://pubs.extension.wsu.edu
Direct link



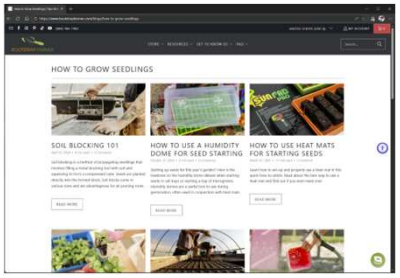
Look for **PNW0170** on https://pubs.extension.wsu.edu
Direct link

4

Growing Guides



Territorial Seed Company Growing Guide



Bootstrap Farmer Seed Starting Growing Guide

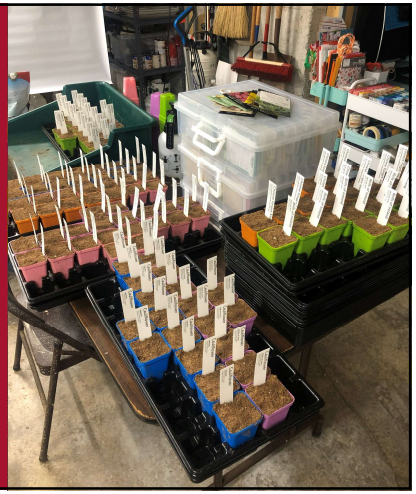
5

Why Start Seeds Indoors?

- **Short growing season.** Indoor starts give heat-loving crops extra time to mature.
- **Cold, wet spring soil.** Seeds germinate better indoors than in soggy ground.
- **Unpredictable spring weather.** Timing can be adjusted despite late frosts.
- **Better performance.** Many vegetables and flowers establish more reliably.
- **Earlier harvests.** Plants are ready to grow as soon as conditions improve.
- **More variety, lower cost.** Seeds offer wider selection than starts from stores.
- **Reduced pest and slug loss.** Larger transplants survive damp-weather pests.
- **Efficient use of summer sun.** Established plants maximize the mild summer.
- **Great for gifts.** With the excess starts, you'll make more friends.

6

Equipment



7

The Basics

Search for "Seed Starter Kit" at your preferred store

A good beginning kit will include:

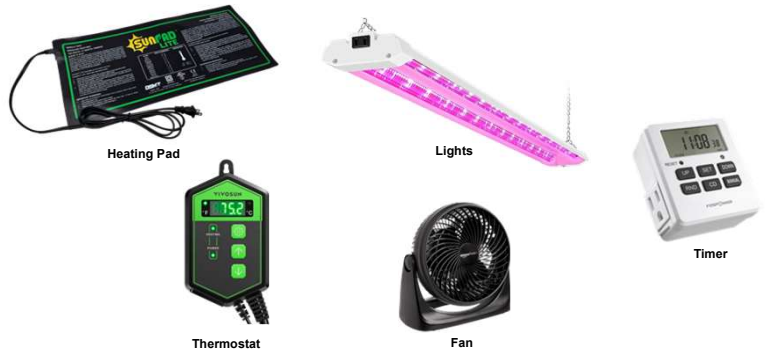
- Seedling tray
- Bottom tray
- Heat mat
- Humidity dome
- Grow lights

8

Shopping List – Trays and Pots

9

Shopping List – Growing Station

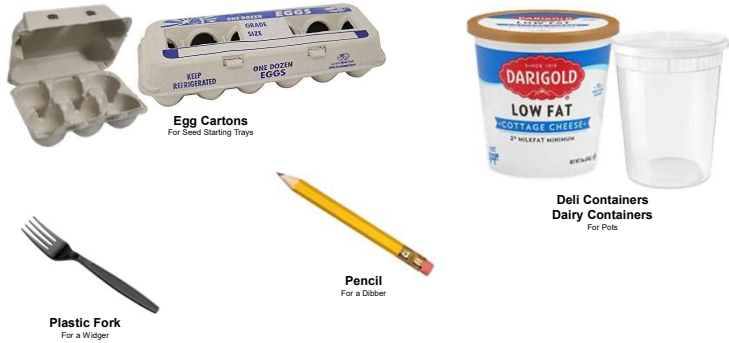


10

Shopping List – Tools

11

Shopping List – Alternatives

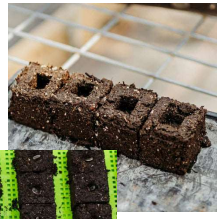


12

Advanced Tools – Soil Blocking

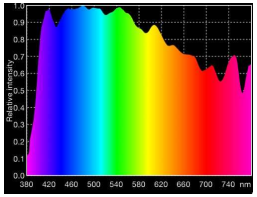
Soil Blocking Tool

Mesh Tray



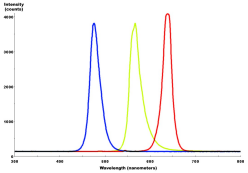
13

Light Color



- Plants do best with light of all wavelengths, but they don't need equal amounts of each
- Grow lights need to provide both **specific wavelengths** and **intensity**
- Putting seedlings by the window indoors does not provide enough sunlight
- Permanent indoor plants need different lights than seedlings
- Typical grow lights a "burple" colored rather than white

Color	Wavelength	Used for…
Infrared Light	720nm – 740nm	Reduces the time a plant needs to flower. Tends to produce larger leaves.
Red Light	630nm – 660nm	Growth of stems and expansion of leaves. Regulates flowering, dormancy periods, and seed germination.
Green Light	500nm – 600nm	Penetrates through thick top canopies to support the leaves in the lower canopy.
Blue Light	400nm – 520nm	Affects the chlorophyll content present in the plant as well as leaf thickness.
Ultraviolet Light	315nm – 400nm	Enhances leaf coloration. Regulates circadian rhythms. Can increase stress tolerance and disease resistance.



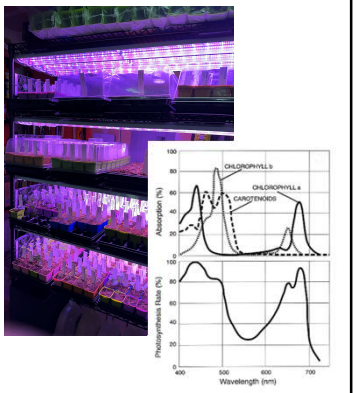
LED lights typically use three different wavelengths combined to create "white" light

14

Wavelengths Used for Photosynthesis

- Seed starts generally only need blue/red "burple" light for photosynthesis
- Any white light will work too

Stage	Most Important Wavelength
Germination & Seedlings	Blue light (≈ 430–470 nm) → controls compact growth, leaf thickness, chlorophyll formation Some red light (≈ 630–660 nm) → supports early photosynthesis
Vegetative Growth	Blue (430–470 nm) → leaf development, stomatal regulation Red (630–660 nm) → photosynthesis efficiency Some green (500–580 nm) → penetrates deeper into canopy
Flowering / Fruiting	Red (630–660 nm) → drives photosynthesis Infrared (700–740 nm) → controls flowering signals via phytochromes
Fruit Ripening / Maturation	Red (630–660 nm) → continued photosynthesis Infrared (700–740 nm) → biomass allocation Blue (small amount) → pigment and antioxidant production



https://en.wikipedia.org/wiki/Photosynthetically_active_radiation

15

Light Timing

Advantage of indoor starting is longer days (generally 12-18 hours)
There can be too much of a good thing

Example: Onions

- Onions are photoperiodic plants — they regulate their stages of growth by day length
- Onions will make top growth until the critical light duration is reached, then bulbing begins
- The amount of growth and development prior to bulbing will determine the bulb size
  - Long-day varieties do well in northern states where summertime day length is between 14-16 hours
  - Short-day varieties do well in southern states and bulb when day length is 10-12 hours; they won't get very large in northern states
  - Day-neutral and intermediate-day varieties start bulbing when day length is 12-14 hours; can be successfully grown anywhere

16

Mediums

17

Seed Starting Potting Soil

- Use a **light, fine-textured seed-starting mix** (not garden soil); does not include bark
- Provides **good drainage** while retaining enough moisture
- Typically, **low in nutrients** to protect young roots
- Common ingredients: **peat or coco coir, vermiculite, perlite**
- Free of **weed seeds, pests, and diseases**
- Avoid heavy or compacted soils that **restrict root growth**

18

General Potting Soil

- **Coarser materials** (bark, compost, wood fiber)
- **Heavier texture** for supporting mature plants
- **Organic matter** with higher nutrient content
- Designed for **longer-term growth**, not germination

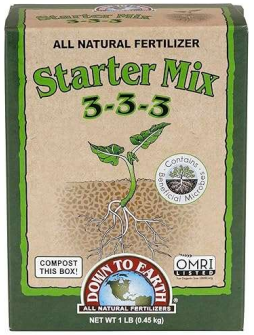
Can use this as a starting point for making your own mix

- Needs sifting to avoid aggregates and coarse materials
- Soil block recipes
- Reusing your own soil (be careful of foreign seeds)

19

Fertilizer

- **Not needed at germination** – seeds contain their own nutrients
- Begin fertilizing after **first true leaves appear**
- Use a low N-P-K and **dilute, gentle fertilizer** (¼–½ strength)
- Look for **balanced or low-nitrogen formulas**
- Best options: **liquid, water-soluble fertilizers**
- Stop fertilizing stressed or newly transplanted seedlings



20

Peat Moss

- Partially decomposed plant material from **bogs**
- **Lightweight and sterile**
- Holds **moisture** while allowing air to reach roots
- Creates a **soft, fine texture** ideal for seed germination
- Naturally **low in nutrients**
- Slightly **acidic**, benefiting many seedlings
- Common base for **seed-starting mixes**

Is Peat Moss Renewable?

- Forms **very slowly** – peat accumulates over **hundreds to thousands of years**
- Harvesting occurs **much faster than natural replacement**
- Often considered **non-renewable on human time scales**
- Peat bogs are important **carbon sinks and ecosystems**
- Some regions regulate harvesting and require **restoration**, but recovery is long-term
- This concern has increased interest in **alternatives like coco coir**

21

Coco Coir

- Made from **fibers of coconut husks**
- **Renewable alternative** to peat moss
- Holds **moisture** while draining well
- Improves **soil structure and aeration**
- **Neutral pH**, suitable for most plants
- Naturally **low in nutrients**
- Often used as a base in **seed-starting mixes**

22

Perlite

- A **volcanic glass** expanded by heat
- **Very lightweight and sterile**
- Improves **drainage and aeration**
- Prevents soil from becoming **compact or waterlogged**
- Does **not hold nutrients**
- Neutral **pH**
- Commonly mixed into **seed-starting and potting mixes**

23

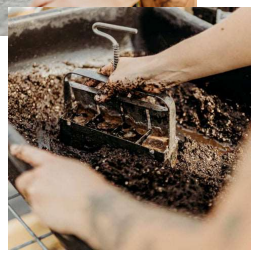
Vermiculite

- A **natural mineral** expanded by heat
- **Lightweight and sterile**
- Holds **water and nutrients** well
- Improves **moisture retention** in seed-starting mixes
- Helps keep soil **loose and aerated**
- Especially useful for **small or shallow-planted seeds**

24

Soil Blocks

- **Compressed blocks of growing medium** with no containers
- Roots are **air-pruned**, reducing transplant shock
- Eliminate need for **plastic pots or trays**
- Require a **fine-textured, well-moistened mix**
- Blocks must be kept **evenly moist**
- Easy to **transplant directly** into soil or larger pots
- Popular for **sustainable and small-space gardening**



Soil Block Formula

Ingredients	Parts	Makes 1 Gallon	Makes 1/2 Bushel	Makes 1 Bushel	Makes 2 Bushels
Peat Moss or Coconut Coir	3	1½ qt	7½ qt	15 qt	30 qt
Perlite	2	1 qt	5 qt	10 qt	20 qt
Compost + Soil	3	1½ qt	7.5 qt	15 qt	30 qt
Lime (if using Peat Moss)	Additive	1¼ tsp	2 tbsp	¼ cup	½ cup
Blood Meal	Additive	1 tbsp	¼ cup	½ cup	1 cup
Colloidal Phosphate	Additive	1 tbsp	¼ cup	½ cup	1 cup
Green Sand	Additive	1 tbsp	¼ cup	½ cup	1 cup

https://extension.psu.edu/programs/master-gardener/counties/susquehanna/penn-state-master-gardener-articles/making-soil-blocks
https://www.bootstrapfarmer.com/blogs/how-to-grow-seedlings/soil-blocking-101

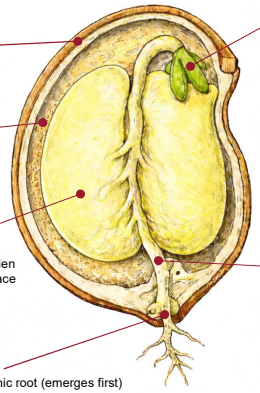
25

Seeds

26

What is a Seed?

A typical dicot seed



Seed coat
protective outer layer

Endosperm
stored energy (starch, oils, proteins) that fuels early growth

Cotyledons
seed leaves; in many garden dicots they absorb or replace the endosperm and later photosynthesize

Radicle
embryonic root (emerges first)

Plumule
embryonic shoot / true leaves

Hypocotyl
stem section below the cotyledons

27

Seed Catalogs

Catalog	Location
Adaptive Seeds	Sweet Home, OR
Baker Creek Heirloom Seeds	Mansfield, MO
Botanical Interests	Broomfield, CO
Burpee	Warminster, PA
Deep Harvest Seeds	Freeland, WA
Ed Hume Seeds	Puyallup, WA
Harris Seeds	Rochester, NY
High Mowing Organic Seeds	Wolcott, VT
Johnny's Selected Seeds	Winslow, ME
Osborne Seeds	Mount Vernon, WA
Park Seed	Greenwood, SC
Renee's Garden	Felton, CA
Resilient Seeds	Ferndale, WA
Seed-Savers Exchange	Decorah, IA
Siskiyou Seeds	Williams, OR
Snake River Seed Cooperative	Boise, ID
Summertime Seed Co.	McMinnville, OR
Swallowtail Garden Seeds	Santa Rosa, CA
Territorial Seed Co.	Cottage Grove, OR
Totally Tomatoes	Randolph, WI
Truelove Seeds	Philadelphia, PA
Uprising Seeds	Bellingham, WA
Victory Seeds	Molalla, WA
Wild Garden Seeds	Philomath, OR
West Coast Seeds	Vancouver, BC
Wild Garden Seed	Philomath, OR

Also seed exchanges…
- King County Seed Lending Library
- Snoqualmie Valley Seed Exchange

28

Climate

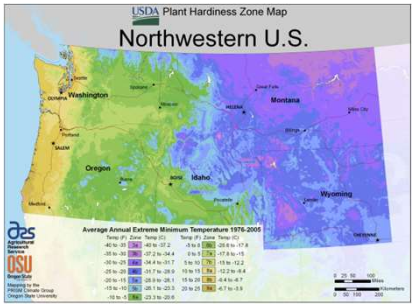
We are in Zone 8b (average low ~15°F to 20°F)
Or Zone 9a (average low ~20°F to 25°F)

- Has a wide variety of soils with a low pH
- Typically, dry from June to September

Considerations:

- Damage from frost
- Disease vectors from moisture

Catalogs will typically state what zones each seed can tolerate



29

Seed Packet Required Information

Federal Seed Act regulates truth in labeling for seeds sold across state lines:

- Crop kind and variety name
- Lot number
- Germination percentage
- Germination test date (month/year)
- Seller's name and address
- Any seed treatment (e.g., fungicide coating)
- Must disclose if it contains restricted or prohibited noxious weeds.

Washington Seed Law applies to seeds distributed *within the state*:

- **Dealer licensing**
- **Seed labeling permits**
- **Prohibition on seed sales without compliance**

30

Seed Sources

1 In-house seed production
Some catalogs grow **a portion** of their own seed, usually:

- Flagship varieties
- Proprietary or exclusive cultivars
- Regionally adapted lines
- Crops easy to produce reliably (lettuce, beans, peas)

Why limited?

- Seed production is land and labor intensive
- Different crops require different climates and isolation distances
- Scaling beyond a subset becomes inefficient

2 Contract seed growers (dominant model)
The catalog:

- Owns or licenses the variety
- Contracts independent farmers to grow it
- Specifies isolation distance, harvest method
- Buys the seed back after testing

Growers are often located where the crop performs best:

- Oregon/Washington: brassicas, beets, carrots
- California: lettuce, tomatoes
- Idaho/Montana: beans, peas
- Arizona/New Mexico: winter seed production
- Chile, New Zealand: counter-season production

3 Wholesale seed suppliers
Many catalogs buy from **large wholesale seed houses**, then:

- Repackage
- Rename the variety
- Write custom descriptions
- Sell at retail scale

Smaller catalogs may source **80–100%** this way.

4 Seed brokers and aggregators
Some vendors act as intermediaries:

- Aggregate seed from many small growers
- Handle cleaning, testing, storage
- Sell bulk lots to catalogs

This is common for:

- Rare or heritage varieties
- International sourcing

31

Seed Types and Enhancements

Seed Types

Certified Organic Seeds follow strict guidelines required by the USDA's National Organic Program (NOP).

F1 Hybrid seeds are the result of a cross between two genetically distinct parent plant lines. Plants from these seeds show more vigor and uniformity than similar standard varieties. Seeds from F1 do not usually carry on these traits.

Open-Pollinated are the varieties of plants that reproduce themselves naturally, through *cross-pollination* (between separate individual plants of the same species and variety via wind, insects, water) or *self-pollination*. Older open-pollinated strains are the varieties we have come to regard as **Heirloom**.

Seed Enhancements

Treated seeds have been coated with a fungicidal treatment that protects the seeds from soilborne pests or pathogens during the seeding and germination phases.

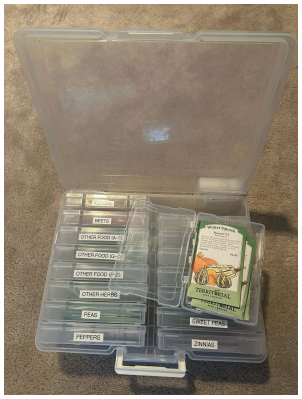
Pelleting is an enhancement that coats the seeds with inert substances (e.g., clay) that render them uniform in size and shape. The pellet coating serves to improve seed visibility, handling, and sowing – making thinning less necessary.

Seed tape is a biodegradable strip usually made of paper or starch. It has seeds pre-spaced and lightly adhered along its length. Gardeners lay the tape directly into a shallow furrow, cover it with soil, and water. This is useful for direct sowing, not for indoor seed starting.

32

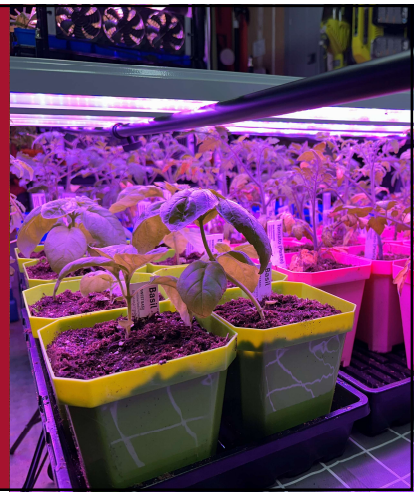
Storing Seeds

- Store seeds in a **cool, dry, dark place**
- Use **airtight containers** (jars, envelopes in sealed boxes)
- Keep away from **heat and moisture**
- **Label** with plant name and date collected
- For long-term storage, keep in a **refrigerator or freezer**



33

Growing



34

Process

Plan
- Choose seeds
- Create a calendar

Clean
- Disinfect

Sow
- Potting
- Direct Sow

Germinate
- Moisture control

Thin
- Give space

Up Pot
- Move to larger pots

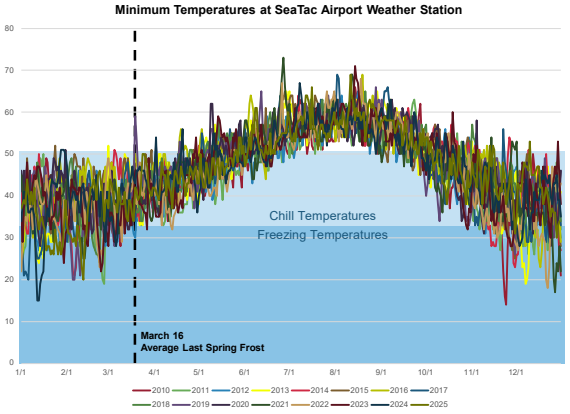
Harden Off
- Prepare for outside
- Expose to UV light

Transplant
- Give your plant a forever home

Harvest
- Reap your rewards
- Save seeds

35

Last Frost Date

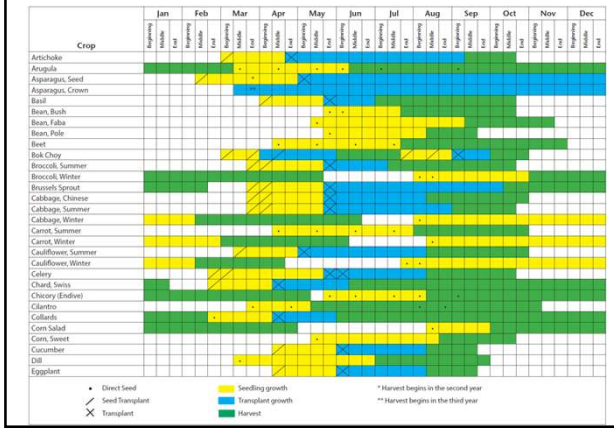


- The frost date (freezing temperatures) determines when you can transplant
  - Some plants still need higher temperatures before planting
  - Some plants like cool temperatures
- Note we have a short summer
- March 16 is average last frost date; April 20 is a safe bet

https://www.ncei.noaa.gov/cdo-web
https://www.timeanddate.com/weather/usa/seattle/climate

36

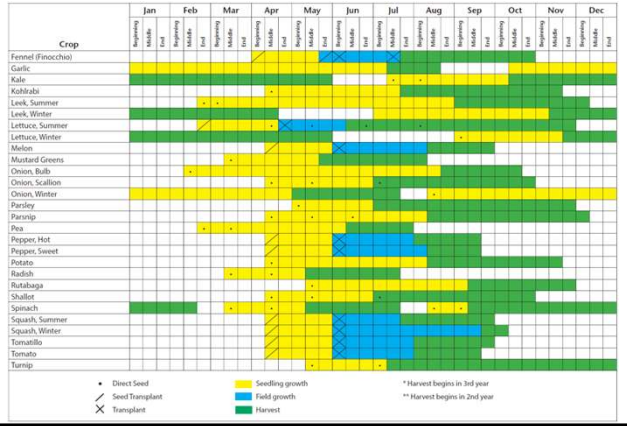
Planting Calendar (1 of 2)



Source: WSU Pub EM057E

37

Planting Calendar (2 of 2)



Source: WSU Pub EM057E

38

Soil Temperature for Germination

Needs cool soil

- Lettuce
- Onion
- Peas
- Radish
- Spinach
- Turnip

Tolerates cool soil

- Leeks
- Nasturtium
- Parsley
- Parsnips
- Potato
- Rutabaga

Needs warm soil

- Muskmelon
- Pepper
- Pumpkin
- Squash
- Sunflower
- Tomato
- Watermelon

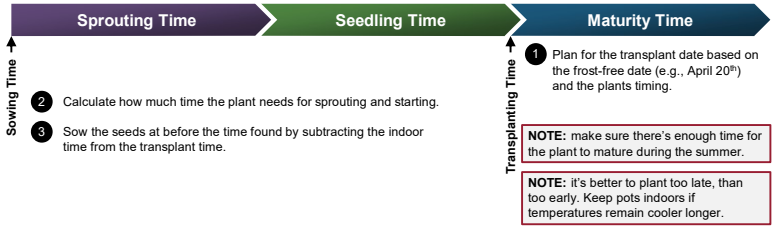
Each plant has its own ideal transplant time. Examples:

- **Basil:** 1 week after
- **Summer Squash:** 2 weeks after
- **Onions:** 4 weeks before
- **Tomatoes:** When soil temperature is above 50°F

Source: WSU Pub PNW017

39

Seed Starting Calendar Formula



You can get organized… here's an excerpt of my spreadsheet:

Crop	Start Date	Sprouts In	Weeks to Start	Time from last frost free date	Plant Date	Germination Temp	Spacing	Frost Hardy	Min Full Sun	Days to Maturity
Basil	3/15	6-10 days	6	1 week after	5/1	65°-70°	8"-12" apart	No	8-12 hrs	30-60 days
Summer Squash	4/5	5-10 days	3 to 4	2 weeks after	5/5	65°-85°	3'-5' apart	No	8-12 hrs	40-60 days
Onions	1/15	7-14 days	8 to 10	4 weeks before	3/25	45°-80°	6"-7" apart	Yes	6-12 hrs	90-120 days
Tomato	4/1	6-14 days	6 to 8	when right temperature	6/1	70°-90°	18"-36" apart	No	8-12 hrs	60-100 days

40

My Seed Starting Spreadsheet

Crop	Sowing	Start Date	Sprouts In	Weeks to Start	Time from last frost free date	Plant Date	Notes	Germination Temp	Spacing	Frost Hardy	Min Full Sun
Onions	Transplant	1/15	7-14 days	8 to 10	4 weeks before	3/25		45°-80°	6"-7" apart	Yes	6-12 hrs
Parsley	Transplant	1/20	14-35 days	9 to 10	2 to 3 weeks before	4/1	Refrigerate seeds for weeks before start	65°-70°	8"-12" apart	Yes	6-12 hrs
Leeks	Transplant	1/25	7-14 days	8 to 10	2 weeks before	4/5	If cannot set out before tops reach 5", cut back tops to 3"	45°-80°	4"-5" apart	Yes	6-12 hrs
Peas*	Transplant	1/25	8-25 days	3 to 4	6 to 8 weeks before	2/23		45°-75°	1" apart		
Kale	Transplant	2/5	6-9 days	4 to 6	4 weeks before	3/25	Best in frosts of spring and fall	45°-85°	8" apart	Yes	6-12 hrs
Celery & Celeriac	Transplant	2/10		10 to 12	1 week after	5/1					
Cabbage	Transplant	2/10	5-17 days	4 to 6	4 weeks before	4/1		55°-75°	18"-24" apart		
Beets	Transplant	2/25	14-21 days	4 to 6	2 weeks before	4/10		50°-85°	4"-6" apart	Yes	6-8 hrs
Broccoli, Summer	Transplant	2/25	5-17 days	4 to 6	2 weeks before	4/10	Start again for succession	55°-75°	12"-24" apart		
Cauliflower, Summer	Transplant	2/25		4 to 6	2 weeks before	4/10					
Lettuce, Summer	Transplant	2/25	2-15 days	4 to 5	3 to 4 weeks before	4/1	Sow again for succession	60°-80°	10"-16" apart	Yes	4-8 hrs
Asparagus	Transplant	3/5	14-21 days	8 to 10	after frost passed	5/1	Soak seeds 24 hours before sowing	65°-75°	18" apart	No	6-12 hrs
Basil	Transplant	3/15	6-10 days	6	1 week after	5/1		65°-70°	8"-12" apart	No	8-12 hrs
Chives	Transplant	3/15	7-14 days	4 to 6	1 week after	5/1		55°-60°	3"-9" apart	Yes	2-6 hrs
Peppers	Transplant	3/20	7-10 days	8 to 12	when high temperature	6/1		70°-95°	18" apart	No	8-12 hrs
Okra*	Transplant	3/25		4 to 6	2 to 4 weeks after	5/10					
Cilantro	Transplant	3/25	7-10 days	3 to 4	2 weeks before	4/20		60°-80°	2"-4" apart	Yes	4-6 hrs
Brussels Sprouts	Transplant	3/25	7-10 days		midsummer	5/25	Plant for a fall harvest	50°-75°	24" apart	Yes	6-12 hrs
Corn*	Transplant	4/1	7-10 days	2 to 4	0 to 2 weeks after	5/1	Plant in rows of 4; succession plant for longer harvest	75°-80°	12" apart	No	6-12 hrs
Cucumber	Transplant	4/1	7-14 days	3 to 4	1 to 2 weeks after	5/1	Needs trellis	70°-90°	18"-36" apart	No	8-12 hrs
Fennel	Transplant	4/1	7-14 days	3 to 4	after frost passed	5/1		65°-90°	6" apart	Yes	6-12 hrs
Tomatillo	Transplant	4/1	7-14 days	6 to 8	when high temperature	6/1		75°-95°	24" apart	No	8-12 hrs
Tomato	Transplant	4/1	6-14 days	6 to 8	when high temperature	6/1		70°-90°	18"-36" apart	No	8-12 hrs
Melons	Transplant	4/5	3-10 days	3 to 4	2 weeks after	5/5		70°-85°	3'-4' apart	No	8-12 hrs
Pumpkins	Transplant	4/5		3 to 4	2 weeks after	5/5					
Squash	Transplant	4/5	5-10 days	3 to 4	2 weeks after	5/5		65°-85°	3'-5' apart	No	8-12 hrs
Shallot	Direct				1 week before	4/15					
Beans	Direct		8-16 days			5/20	Needs trellis	60°-85°	4" apart	No	8-12 hrs
Carrot, Summer	Direct		12-18 days			4/15		50°-75°	2"-3" apart	Yes	6-8 hrs
Dill	Direct		7-21 days			3/15		55°-85°	2"-4" apart	Yes	8-12 hrs

This spreadsheet is vegetable data gathered from information guides and seed packets. I left out flowers from this presentation. Data may be incomplete.
Last frost date is assumed to be Apr 20.

41

Read Seed Packet Instructions

Seed packet with tell you about special instructions

Cold Stratification (chilling needed)
- Lavender
- Many native perennials

Light Needed to Germinate (do not cover)
- Lettuce

Scarification (seed coat must be weakened)
- Nasturtium

Very Slow or Uneven Germination
- Parsley
- Celery
- Rosemary

Warm Soil Required
- Peppers
- Eggplant
- Basil

42

Cleaning

Clean all trays, heating mats, and surfaces!

Trays and Pots
- Wash and remove last year's dirt and debris
- Soak for 30 minutes (9 parts water to 1 part bleach)
- Rinse thoroughly and air dry completely before storing

Tools
- Do not use bleach
- Best choices: Lysol or 70% isopropyl alcohol
- Clean tools of dirt, debris before disinfecting
- Wipe excess disinfectant to avoid injuring plant

https://s3.wp.wsu.edu/uploads/sites/403/2015/03/cloroxed-clippers.pdf

43

Indoors versus Direct Sowing

Sow Indoors
- Start seeds inside before outdoor planting
- Best for long-season or cold-sensitive plants
- Gives earlier, more controlled growth

Direct Sow
- Plant seeds directly in the ground
- Best for fast growers and root crops
- Simple and avoids transplant shock

Plants that prefer direct sowing
- Carrots
- Radishes
- Beets
- Turnips
- Beans
- Peas
- Corn
- Squash
- Cucumbers
- Melons
- Sunflowers
- Poppies

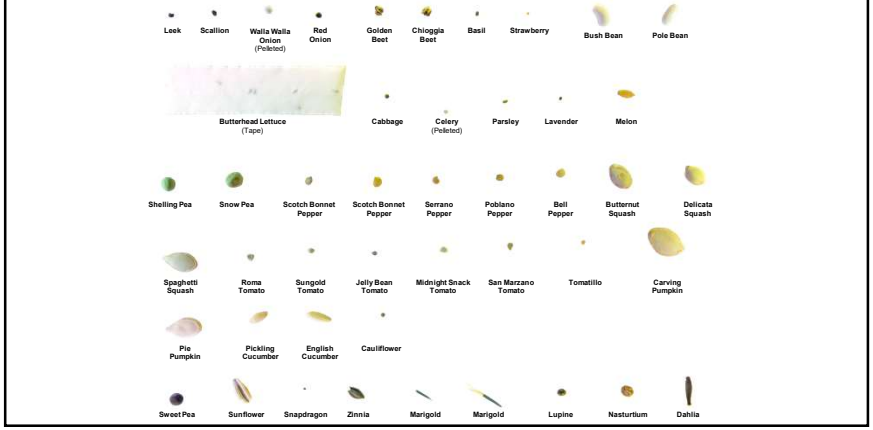
Still can start these indoors if you want

44

Seed Sizes

45

What Are They?



46

Potting Seeds Step-by-Step

1. **Fill containers.** Loosely fill pots with seed-starting mix. Do not pack it down tightly.
2. **Plant seeds at the correct depth.** Use a dibber to make a hole the correct depth. Be generous with seeds – okay to put too many into a pot – we'll fix it later.
   - General rule: plant seeds about **2x as deep as the seed is wide**
   - Very small seeds: press onto the surface and lightly cover (or don't cover at all)
3. **Cover gently.** Lightly sprinkle soil or vermiculite over seeds and gently firm the surface. Do not compact the soil.
4. **Moisten the soil.** Dampen from the top with a gentle spray bottle. Do not overdo it.
5. **Cover the tray with humidity dome.** And place on heating mat under light as needed.
6. **Water carefully.** Water from the bottom to avoid washing seeds away.
7. **Label everything.** Write the plant name and date planted!

47

Labels

- Don't forget labels – also called **pot sticks**
- Include plant name, variety, and planting date
- Use **durable materials**: plastic, metal, or sealed wood last longer than popsicle sticks
- Write with **waterproof ink** – pencil or UV-resistant marker prevents fading and smearing
- Label at **planting time** – don't trust your memory
- **Reuse and sanitize** – clean old labels to avoid disease spread

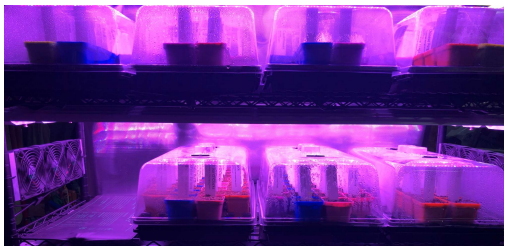
48

Watering

Overwatering is a Problem
- Causes root rot and fungal disease
- Weakens young seedlings

Best Practice: Bottom Watering
- Put water in bottom tray – let soil absorb moisture from below
- Humidity dome effectively rains water back to the surface
- Only add water before the soil dries out

Tips
- Soil should be moist, not soggy
- Let the top dry slightly between waterings
- Never let seedlings sit in water continuously



49

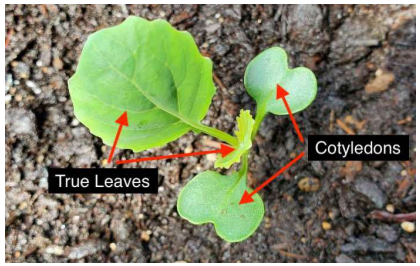
Heating Pads

- **When to use heat**: for warm-season crops (tomatoes, peppers, eggplant, basil) or when room temps are below ~70°F (21°C)
- **When *not* to use heat**: for cool-season crops (lettuce, spinach, brassicas) or if ambient soil temps are already warm
- **What heat does**: speeds and evens out germination; it does *not* replace light
- **Ideal setup**: seedling heat mat under trays, with a thermostat if possible (usually 75–85°F soil temp)
- **Avoid overheating**: heat + dry air can desiccate seeds or cook roots; check moisture daily
- **As soon as 50%-70% of seeds in tray sprout**: remove trays from heat
  - Many seedlings prefer cooler soil and can become leggy or stressed if left on heat
  - Some warmth loving plants (peppers) do better with heat
- **After heat removal**: move seedlings to bright light and moderate temperatures for strong growth

50

Germination

- **Germination time varies.** Most seeds sprout in **3-14 days**. Check seed packet.
- **Temperature affects speed.** Warm-season crops need higher soil temps
- **Keep soil evenly moist.** Not soggy; drying out can stop germination
- **Light vs. dark germinators.** Some seeds need light, others need darkness
- **Warmth speeds germination.** Soil temperature often matters more than air temperature.
- **Cotyledons (seed leaves).** The first leaves to appear; they provide stored energy for early growth. Cotyledons look different
- **True leaves develop next.** These resemble the adult plant and begin photosynthesis.



51

Humidity Domes and Fans

Remove the humidity dome once 50%-70% of the starts have sprouted

52

Thinning

Thinning removes extra seedlings so remaining plants have room to grow.

Why It's Important

- Back when sowing, might have put more than necessary to ensure enough pots had seedlings
- Reduces competition for light, water, and nutrients
- Prevents weak, crowded plants

How to Thin

- Wait until seedlings have 1–2 true leaves
- Snip extras at soil level with floral snips (don't pull)
- Keep the strongest seedling

Many greens can be eaten after thinning

https://www.gardeningknowhow.com/garden-how-to/propagation/seeds/thinning-seedlings.htm

53

Up-Potting

Starting in smaller pots

- Uses less water – early seedlings have smaller roots
- Uses space efficiently – not all seeds will germinate

Up-Potting seedlings

- Move seedlings to larger containers as they grow
- Gives roots enough room to develop
- Up-pot when roots fill the container or circle the bottom
- Use fresh potting mix
- Handle seedlings gently – use a widger to get seedling out of container
- Water well after repotting

54

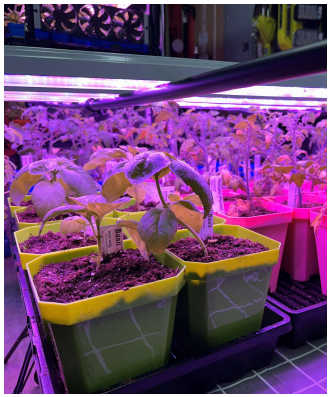
Lighting and Fan Adjustments

Lighting

- Seedlings need bright light to grow strong
- Keep lights close to seedlings – raise as they grow
- Adjust light height as plants grow
- Provide 12-18 hours of light daily
- Prevents tall, weak (leggy) seedlings

Fan

- Gently moves air around seedlings
- Helps strengthen stems
- Reduces mold and disease
- Use a low setting or indirect airflow
- Run fan on timer for short periods each day



55

Hardening Off

- Gradually introduce seedlings to outdoor conditions – prevents transplant shock
  - Plant gets used to UV radiation
  - Plant gets used to change in weather patterns (wind, rain, clouds)
  - Plant gets used to night to day temperature swings
- Can start as soon as there are 3+ sets of true leaves
- Start with 1–2 hours outside in shade
- Increase time and sunlight over several days
- Protect from wind, cold, and strong sun – pests too!
- Bring plants inside at night if temperatures drop

Example Schedule

Schedule	Time Outside
Day 1	2-3 hours
Day 2	3-4 hours
Day 3	4-5 hours
Day 4	5-7 hours
Day 5	7-9 hours

56

Transplanting Outdoors

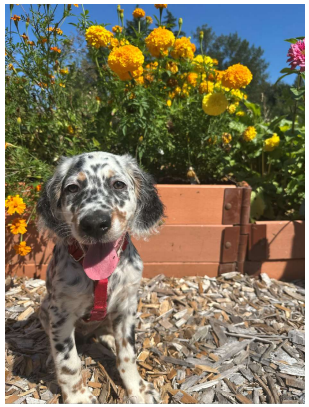
- Transplant after danger of frost has passed
- Choose a cloudy day or late afternoon
- Handle plants carefully – use a widger to get plant out of the pot
- Plant at proper depth (deeper for tomatoes)
- Water thoroughly after planting

Also, a great time to sell and share starts!

57

Harvest

- **Harvest at peak maturity.** Flavor, nutrition, and yield are best when crops picked at the right stage
- **Signs of readiness.** Size, color, firmness, and days to maturity vary by crop
- **Harvest regularly.** Frequent picking encourages continued production
- **Use proper tools.** Clean, sharp scissors or pruners prevent plant damage
- **Harvest at the right time of day.** Early morning is best for most crops to reduce stress and wilting
- **… or save seeds**



58

Thank You!

And now for some closing announcements before questions…

59

Resources

Growing Guides

- https://territorialseed.com/pages/growing-guides-spring
- https://www.bootstrapfarmer.com/blogs/how-to-grow-seedlings
- https://pubs.extension.wsu.edu/product/home-vegetable-gardening-in-washington-home-garden-series
- https://wpcdn.web.wsu.edu/wp-ecommerce/uploads/sites/2/product-4453-sku-PNW0170.pdf

Equipment, etc.

- https://www.johnnyseeds.com/tools-supplies/seed-starting-supplies
- https://www.bootstrapfarmer.com/collections/seedling-starter-kits
- https://gardenware.com/products/pot-sticks

Other Information

- https://ntrs.nasa.gov/api/citations/20190029077/downloads/20190029077.pdf
- https://www.gardenmyths.com/led-grow-lights-color-spectrum
- https://en.wikipedia.org/wiki/Photosynthetically_active_radiation
- https://extension.psu.edu/programs/master-gardener/counties/susquehanna/penn-state-master-gardener-articles/making-soil-blocks

Special thanks to Bootstrap Farmer for use of many images in this presentation

60

2026 Presentations

2026 Growing Groceries: Beyond the Basics
Wednesdays 7:00pm-8:30pm

Date	Class
Wed, January 21	The Art and Science of Seed Starting
Wed, March 11	Evaluating Soil, Soil Testing and Interpreting Results
Wed, May 6	A Gardeners Guide to Integrated Pest Management
Wed, July 15	All About Seed Saving
More info:	https://kingcounty.mastergardenerfoundation.org/education/growing-groceries-classes/

2026 Growing Groceries: The Basics
Pre-recorded classes

To register	Topic
This series offers six (6) pre-recorded classes with video links that are delivered immediately upon registration to allow for self-paced viewing. https://lp.constantcontactpages.com/ev/reg/5bvz2d5	Container Gardening
	Backyard Fruit Trees
	The Cool Season Menu: Peas, Hardy Greens, Carrots and More
	Grow Kale, Broccoli, and Related Cole Crops
	What's a Garden Without Tomatoes?
	Beans, Summer and Winter Squash

61

Education Resources

Ask a Master Gardener

Visit: https://extension.wsu.edu/king/ask-a-master-gardener

Washington Green School

Learn the science of sustainable gardening. Join Green School to expand your gardening knowledge and explore growing your own food, soil science, pest management, climate resilience, pollinators, and find out about all the benefits that consumer horticulture has on individuals, families and communities.
Visit https://greenschool.extension.wsu.edu/

Become a Master Gardener

For information on King County Master Gardener training (including signing up for the email notification list), visit: https://extension.wsu.edu/king/gardening/become-a-master-gardener

Applications for the 2027 Master Gardener and class will open in July and run through August 2026.

62

Questions?

63

Thank you for your support!

Growing Groceries

is brought to you by

King County Master Gardener Program
https://extension.wsu.edu/king/gardening
- Demonstration Gardens
- Plant Clinics
- Education Outreach
- Science-based Publications

Master Gardener Foundation of King County
http://www.mgfkc.org
- Fundraising for these programs

More information about growing groceries:
https://kingcounty.mastergardenerfoundation.org/education/growing-groceries-classes

64