Seed Starting & Plant Propagation

A 2019 Garden Talk Presentation

By J.D. & Catherine Connor

Acknowledgment Of Sponsors

2019 Garden Talks happen thanks to the collaboration of:

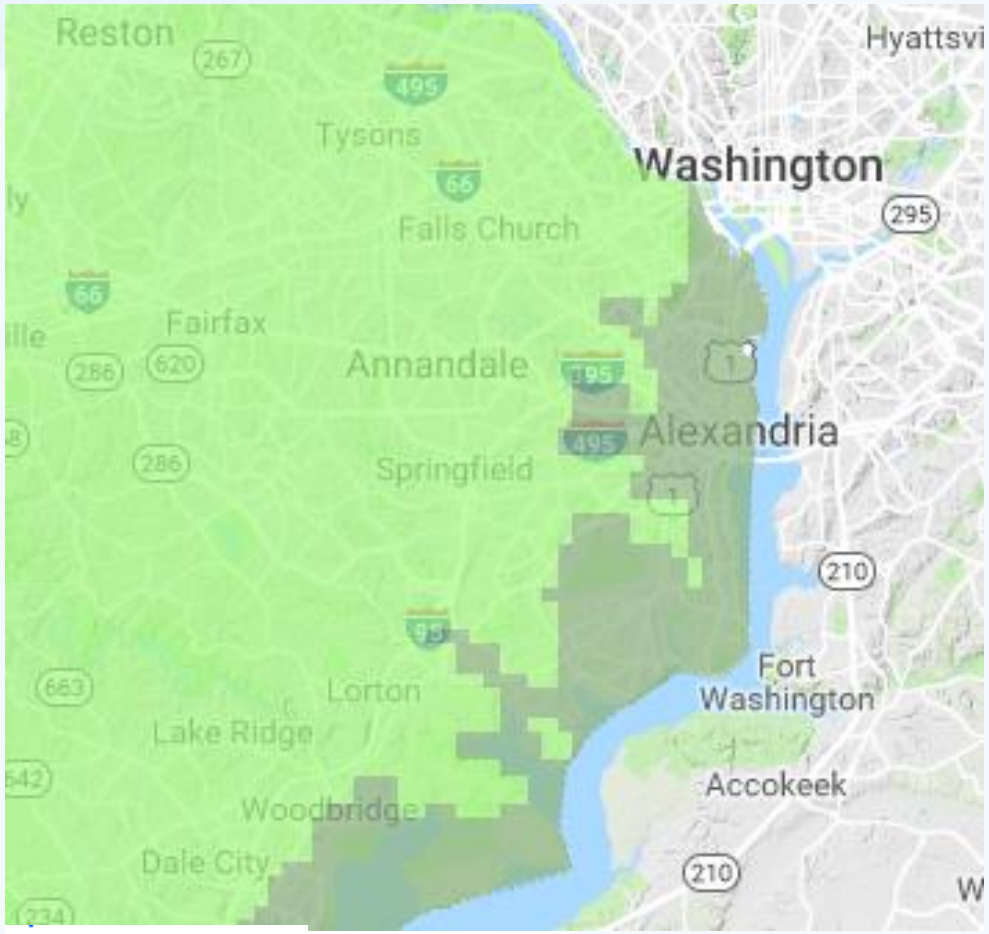
- Arlington Food Assistance Center "Plot Against Hunger Program"
- Arlington Friends of Urban Agriculture
- Arlington Public Library – "Arlington Reads, Arlington Grows"
- Master Gardeners of Northern Virginia Volunteers
- Virginia Cooperative Extension Service – Arlington/Alexandria Office

What we'll cover

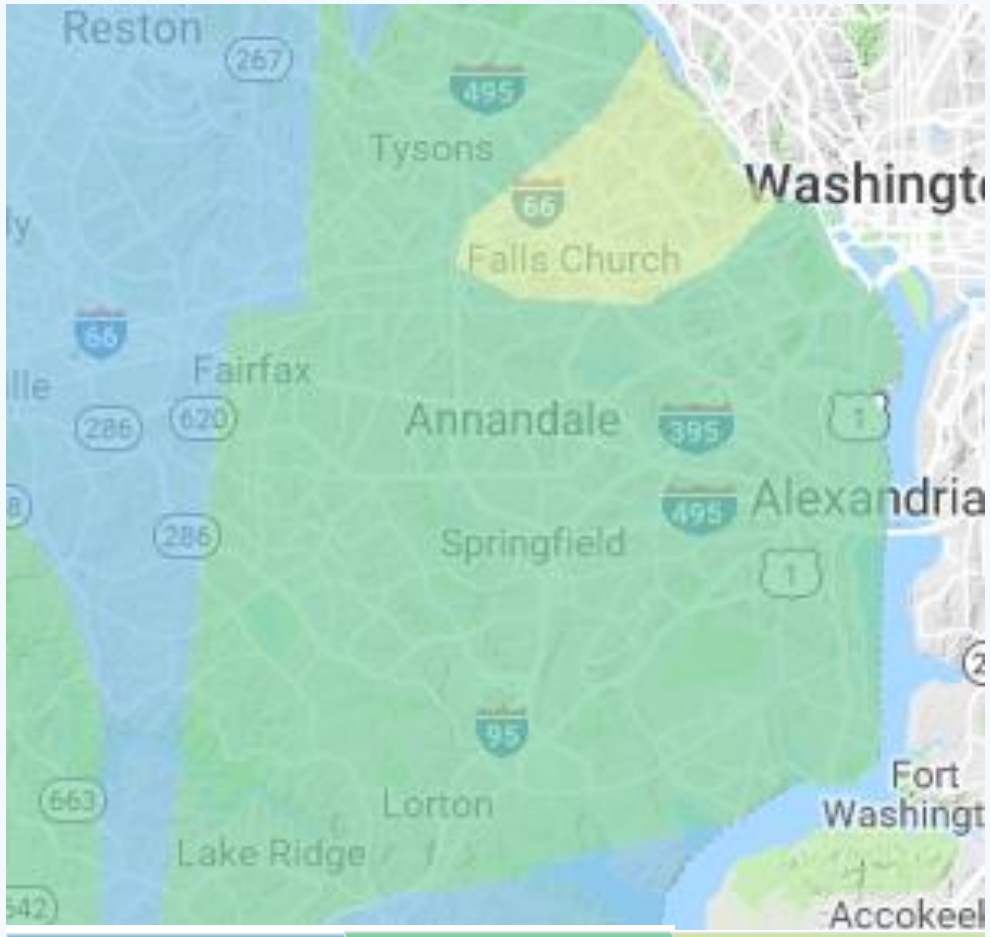
- Crop Types
  - Cool vs. Warm Season Crops
  - Plant Families & Companions Plants
- Direct Sow vs. Plant a Seedling vs. Vegetative Propagation
- Seeds
  - How to Select Seeds
  - Seed Germination Basics
- Growing & Transplanting Seedlings
  - Winter Sowing Method
  - Indoors
  - Fall Planting

Our Climate – Cold & Heat

USDA Plant Hardiness Zones
– Average annual extreme minimum temps



AHS Plant Heat Zones
– Number of days >86°F in an average year



http://www.plantmaps.com/

Our Climate – Growing Season Length

- Growing season is approximately 26 (33) weeks – USDA Zone 7a (7b)
  - Average Last Killing Frost 4/20-30 (4/10-4/21)
  - Average First Killing Frost 10/19-29 (11/8-11/28)
- Most of our highly desirable vegetables are frost killed
- Covering up crop will provide 4-6 degrees of protection

http://extension.umd.edu/hgic/topics/when-plant-vegetables-maryland

https://garden.org/apps/frost-dates/ ← probability of 16° to 36° temps

https://www.sustainablemarketfarming.com/2018/01/23/winter-kill-temperatures-of-cold-hardy-vegetables-2018/

Cool vs. Warm Season Crops

- **Cool-season**. Cool-season crops come to harvest in cool weather, either in spring or fall or winter.
  - Cool-season crops can be planted when the soil and air temperatures are as low as 40°F.
  - Mature cool-season crops can survive in temperatures near freezing without protection. In contrast, cool-season crops do not do well in the warmest summer temperatures
- **Warm-season crops** should be planted so that they mature when the weather is warm, when the soil and air temperatures are above 50°F.
  - Many will grow best when the temperature is 75°F.
- Planting Calendars

Planting chart

Virginia Cooperative Extension Arlington Office
3308 S. Stafford St. Arlington VA 22206

USDA Hardiness Zone 7b
Avg last killing frost: 4/1-4/10
Avg first killing frost: 11/1-11/10

Horticulture Help Desk: 703 228 6414
mgarlalex@gmail.com

Month	March				April			May			June			July			August			September			October		
Date	1	11	21	31	10	20	30	10	20	30	9	19	29	9	19	29	8	18	28	7	17	27	7	17	27
Crop																									
Collards	P								H								P							H	→
Onion, set	P				P&H					H															→
Peas, garden	P						H																		
Radish	P		P&H				H										P		P&H						→
Spinach	P				H															P				H	→
Turnips	P				H												P				P&H		H		→
Potatoes		P									H														
Beets			P						H									P						H	→
Cabbage*			P						H							P						H			→
Carrots			P						H				P&H			P			H						→
Lettuce, bibb			P							H						P					H				→
Lettuce, leaf			P					H								P				H					→
Broccoli*				P							H					P&H	P						H		→
Brussels sprouts*				P								H				P							H		→
Cauliflower*				P					H							P					H				→
Beans, bush						P					P&H						H								
Beans, pole						P								P&H		H									
Corn, sweet						P							P&H				H								
Cucumbers							P					P&H								H					
Eggplant*							P								H										
Muskmelons							P							H											
Cantaloupe							P							H											
Peppers*							P							P&H	H										
Pumpkins							P								H										
Squash, summer							P				P&H								H						
Squash, winter							P									H									
Sweet Potato							P									H									
Tomatoes*							P						P&H		H										
Watermelon							P								H										
Key																									
Plant																									
Plant & Harvest																									
Harvest																									
* Transplants - See notes on reverse						Start																			

Plant Types

- For **annual** plants, one generation per year is the norm.
  - If allowed to go to seed, annuals may reseed themselves & grow as a plant "volunteer" the next year.
- **Perennial** plants live more than two years.
  - They may be grown/consumed as annuals.
  - Artichoke, asparagus, sweet potato, chives, garlic, ginger, lemon balm, mint, sage, strawberries, thyme, shallots, and leeks among others.

Plant Families & Companions Plants

- Different **plant families** are subject to similar diseases and pests
  - When feasible, practice "**crop rotation**" for disease prevention, insect control & soil nutrient balance.
- Individual crops benefit from good **plant communities**.
  - Practice "**companion planting**" to take advantage of symbiotic relationships and avoid plants competing for resources.

PLANT FAMILY	VEGETABLE
Carrot Family (Apiaceae)	Carrot, celery, parsley, parsnip
Goosefoot Family (Chenopodiaceae)	Beet, spinach, Swiss chard
Gourd Family (Cucurbitaceae)	Cucumber, muskmelon, pumpkin, summer squash, watermelon, winter squash,
Grass Family (Poaceae)	Ornamental corn, popcorn, sweet corn
Mallow Family (Malvaceae)	Okra
Mustard Family (Brassicaceae)	Broccoli, Brussels sprouts, cabbage, cauliflower, Chinese cabbage, collard, kale, kohlrabi, mustard greens, radish, rutabaga, turnip
Nightshade Family (Solanaceae)	Eggplant, pepper, potato, tomato
Onion Family (Alliaceae)	Chives, garlic, leek, onion
Pea Family (Fabaceae)	Bush bean, kidney bean, lima bean, pea, pole bean, soybean
Sunflower Family (Asteraceae)	Endive, lettuce, sunflower

https://watauga.ces.ncsu.edu/files/library/95/crop%20rotation%20factsheet.pdf

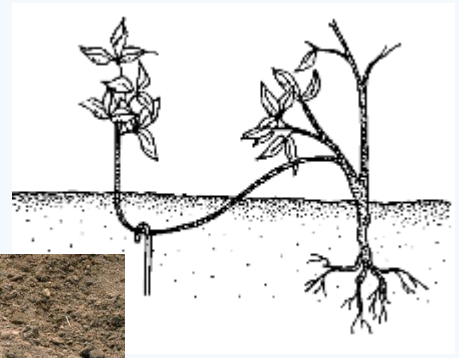
https://www.ext.vsu.edu/s/Companion-planting-Revised.pdf

Direct Sow vs. Plant a Seedling

- Direct Sown Vegetables
  - There are certain crops that should be direct sown either because they are root sensitive or have a tap root that can't be transplanted well.
    - Carrots, parsnip, peas, Swiss chard, and beans
- Transplanted Vegetables
  - Some crops are most successful grown as seedlings first based on maturity needed for fruiting
    - Tomatoes, peppers, eggplants
  - Other crops that can be grown as seedlings first in effort to get a head start
    - Lettuce, cole crops, most greens
    - For cool weather crops, ahead of Spring or ahead of Fall

Vegetative Propagation Methods – Examples

These methods create a **genetic clone** of the parent plant.



In **simple layering**, the **stem** is bent down and the target region buried in the soil.
The stem generates **adventitious roots**.

This happens naturally with <u>strawberries</u>.

Dorling Kindersley
Getty Image

Adventitious buds form on **roots** near the ground surface, on damaged stems (as on the stumps of cut trees), or on old roots. These develop into above-ground stems and leaves.

This happens naturally with "seed" <u>potatoes</u>.

Vegetative Propagation Methods – Continued

Similarly, "slips" grow out of sweet potatoes soaked in water.

Herbs are great candidates to grow roots from stem cuttings, and then full plants from the cuttings.

https://www.traditionalmedicinals.com

Garlic is commonly started from cloves.

How to Select Seeds – Read Seed Catalog & Seed Packet!

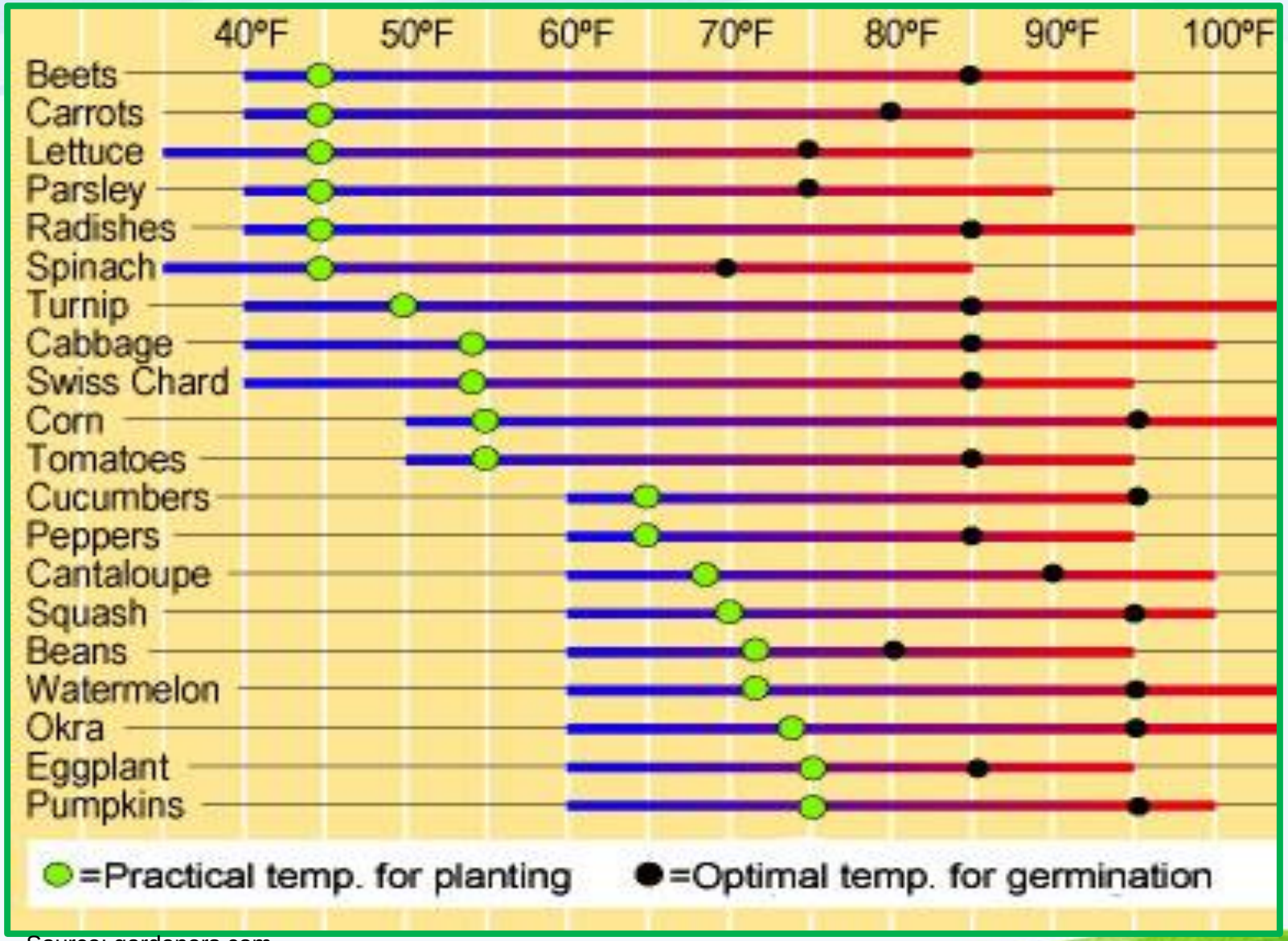
- What you can grow (crop suitability for your garden conditions)
  - Hardiness/Heat Zones
  - Light exposure
  - Type of soil/bed (e.g., growing in containers vs raised bed vs in ground)
- What you want to grow (number of plants given space available)
  - Motivation for growing (feed family, 'giving' garden, fun with grandchildren)
- Seed Type
  - Open pollinated (OP) vs hybrid (F1), heirloom, organic
  - Reading seed packets and seed catalogs for seed type and disease resistance
- Seed Viability – Freshness and storage conditions

https://marylandgrows.umd.edu/2014/07/28/define-your-terms-hybrid-heirloom-gmo-etc/
https://extension.umaine.edu/publications/2750e/ (seed saving)

Seed Germination Basics

- Soil temperatures necessary for seed germination
- Moisture requirements
  - Moisture is critical for germinating seeds. Moist but not soggy. Additionally, seeds require oxygen and if kept in a waterlogged state may rot. On the other hand, if the soil dries out, the seed will lose whatever water it has absorbed and will die. Finding the middle ground can be difficult and comes easier with practice.
- Light requirements / soil depth
  - Not all seeds have the same light requirements. Most seeds germinate best under dark conditions and might even be inhibited by light.
  - No deeper than twice its diameter.

SOIL Temperatures Needed for Seed Germination



Source: gardeners.com

What to Look for When Purchasing Seedling

- All this also applies when accepting donated seedlings…
- Select a reliable source (feel free to ask questions)
- Whether vendor provides useful variety details
- Seasonal appropriateness (size ready to go in the ground?)
- Pot size and whether root bound (need for interim up-potting)
- Make sure the seedlings have been "hardened"

Get a Head Start by Growing Seedlings Outdoors with the Winter Sowing Method

What is Winter Sowing?

Alternative way to extend the season by sowing seed earlier than you would direct sow.

- Planted in "mini greenhouses" during cold winter months
- Much cheaper and require less supervision than starting seed indoors
- Germinate outside
- No need to harden seedlings – they're already accustomed to spring weather fluctuations
- No risk of seedlings "damping off"

Zone 7 Winter Sowing: What to Winter Sow & When

- **January**: Hardy perennial flowers & plants that require stratification
- **February – Early March**: Most herbs and frost-tolerant vegetables
- **Late March - April**: Tender plants, annual flowers and warm-loving vegetables

Some seeds are not conducive to winter sowing:
tap root vegetables (parsnip / carrot) and those plants whose roots are sensitive to transplant (…chard, beans, peas…)

Selecting Containers for Winter Sowing (WS)

- Deep enough to hold ~3" of soil ("thumb depth rule"
- Plastic gallon milk jugs are best
- Clear juice containers
- 2 liter soda bottles
- Foil roasting pans with clear lids
- Salad boxes
- Use your imagination

WS Container Preparation

- Rinse
- Cut along mid-line leaving enough to serve as a hinge
- Drainage: 4-6 holes/slits
- Air transpiration: leave caps off of containers
- Soil
  - Use good quality potting mix
  - Depth of at least 3'' (thumb)
- Soak and drain well

How Many Seeds Per Container?

- **Size of seeds** – more when smaller is ok
- **Type of plant** – influences how you lay them out
- **How many you want** in your garden space
- **Cost of seed** – influences how you lay them out
- **Germination rate** – more if lower rate anticipated

Sow at Recommended Depth
Cover with Soil to Recommended Depth & Moisten Well

Label, Close & Place Outside

- Label crops inside and out!
- Consider keeping a spreadsheet
- Seal WS container (top open)
- Place outdoors
- Should be in full to part sun

Date Seeded	Type of Container	Plant Name	Variety And/Or Scientific Name	Other Plant Details	Results / Notes
1/23/2018	Gal Milk	Lettuce	Parris Island Romaine / Lactuca sativa	1/8" speth, 12" space, 7-14 days sprout/65 days mature	WRG - Beds 9 & 2 (between beets / 1/2 bed width)
1/23/2018	Gal Milk	Collards	Georgia Southern / Brassica Oleracea	1/4" depth, 18" space, 7-14 days sprout/75 days mature	Glebe/Lang - Transplanted with Ruth Ann to the Shady Greens Garden on 4/2/18
1/23/2018	Gal Milk	Collards	Georgia Southern / Brassica Oleracea	1/4" depth, 18" space, 7-14 days sprout/75 days mature	WRG - Bed 9 on 3/25/18
1/23/2018	Gal Milk	Spinach	Riccio America (Pagano)	30cm space	WRG - Bed 5A on 3/25/18

WS Container Care – Once Seedlings Appear

- **As temps warm:**
  - May need to move to more shade
  - On a sunny day, temperature inside container may be 20° warmer than outside
  - Might open lid/top half of container during the day
- **During cold spells:**
  - Protect sprouted tender plants
  - Throw a blanket over / move to sunny corner protected from wind…
  - Hardy plants will usually not mind…
- **Don't allow them to dry out**
  - If needed, preferably water from bottom
- Transplant after seedlings have 1-2 sets of true leaves

Planting Out

When?

- When the ground thaws
- When your seedlings show a second set of leaves
- When other conditions permit…

How?

- Separate using "Hunk 'O Seedlings" (HOS)
- You can cut them like you would a brownie pan

Care for young transplants

- Keep watered
- Watch for pests (slugs, leaf cutters, etc.)

Provide a Larger Container When Warranted

- Up-potting gives plants room to grow, and stimulates feeder roots
  - Failing to up-pot your seedlings when needed will result in an unhealthy root system
- You might need to up-pot because:
  - The "permanent" spot is not ready
  - You plan to give away individual plants
  - You want the seedlings to grow larger before transplanting to their permanent spot
- To up-pot:
  - Transplant at depth in original container
  - Handle by leaves, not stem or roots
  - Firm soil & water gently
- Can provide richer soil

3/6/2019

Tips for Successful Planting – apply to all seedlings

- Transplant on a cloudy windless day if possible
- Prepare the planting hole deep/wide enough to accommodate roots
- All but tomatoes get planted at same depth (plant tomatoes ~6" down)
- Handle seedlings by their leaves (not stems or roots)
- Cut the side of the WS container open to slide plants out
- Transfer "brownie" pieces or individual plants as warranted
- If seedling is "root bound" gently break up the outer roots
- Firm the media around each plant and water gently and well – water regularly until roots are established

Indoor Seed Sowing

- Start seeds indoors to transplant (don't start too early)
  - 4-6 weeks: Cabbage, Cauliflower, Brussel Sprouts, Broccoli
  - 6-8 weeks: Tomato, Eggplant, Pepper
- Additional crops which naturally grow better in cool weather: lettuce, kale, celery, spinach
- Give herbs and flowers an early start: marigold, basil, borage

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Crop										
Collards	P								H	
Onion, set	P				P&H					H
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Spinach	P				H					
Turnips	P				H					
Potatoes		P								
Beets			P						H	
Cabbage*			P						H	
Carrots			P						H	
Lettuce, bibb			P							H
Lettuce, leaf			P					H		
Broccoli*				P						
Brussels sprouts*				P						
Cauliflower*				P					H	

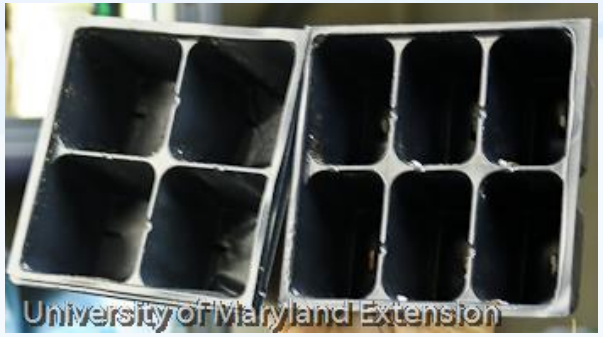
To Start Seedlings Indoors You Need Room & Equipment,

and you need to check daily

- Containers
- Seed starting soil mix
- A heat source
- A light source
- Water
- Seeds
- Tray – Plastic cover – Fertilizer

Illustration by Elayne Sears

https://extension.umd.edu/hgic/starting-seeds-indoors



Containers and Medium

Purchased or home made

2''-3'' pots/cells are fine to start most everything

4''-6'' and larger pots may be needed before seedling are ready for transplanting to their permanent location

Ensure drainage

Sterile soilless seed starting mix

Heat and Light

Heat source underneath the pots helps soil temperature be optimum for germination

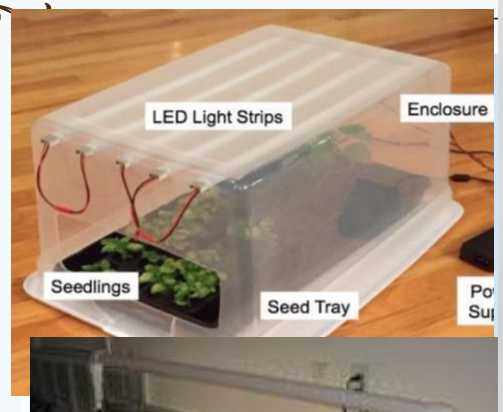
Remove heat source once seeds sprout

Consider using a thermostat

Adjust lights– 3-6" from plant tips

Consider using a timer – 14-18 hours on

If relying on sunshine, rotate regularly



https://extension.umd.edu/hgic/tips-growing-vegetable-transplants

Water and Fertilizer

Keep moisture constant through establishment

Water gently, such as from the bottom, or with a spray bottle/nozzle

Ensure good drainage

Keep tray covered during germination to retain moisture – remove upon seed sprouting

You do not need to apply fertilizer unless you grow seedlings beyond ~6 weeks

Thin & Transplant After 1 – 2 Sets of True Leaves

- Thin to healthiest seedling
  - Clip, don't pull, to thin
- Transplant to larger pot at depth in original container
  - Handle by leaves, not stem
  - Firm soil & water gently
  - Gives plants room to grow
  - Stimulates feeder roots
- Can provide richer soil

Prepare Seedlings for Life Outside & Other Considerations

- You may need to "up-pot" your seedlings because the "permanent" spot is not ready or it is too early to plant the crop outside
- **"Harden off"** by progressively acclimating the seedlings to outside conditions

How to Plant Seedlings – same as WS starts

- Transplant on a cloudy windless day if possible
- Prepare the planting hole deep/wide enough to accommodate roots
- All but tomatoes get planted at same depth (plant tomatoes ~6" down)
- Handle seedlings by their leaves (not stems, not roots) –
  Carefully dig up the small plants using a butter knife/plant label
- If seedling is "root bound" gently break up the outer roots
- Firm the media around each plant and water gently and well – spread mulch – water regularly until roots are established

Growing Seedlings for Fall Planting

- If Growing Indoors
  - You (should) have full control of growing conditions
  - Hardening may involve acclimating the seedlings to the heat outdoors
- If Growing Outdoors
  - Temperatures will normally be conducive to seed germination
  - Temperatures may not be conducive to happy seedlings
- In All Cases
  - Adjust watering needs
  - Protect young seedlings from extreme heat…

Keys to success

- Time planting appropriately
  - Avoid sowing too early – inside or outside
  - Indoors, grow lights & proper temperature discourage weak, spindly plants that don't perform well
- Use containers that minimize transplant shock
- Avoid mold & fungal infections
  - Provide good air circulation, adequate light, proper moisture & sterile soil
- Secret ingredient to success:
  - Check indoor starts daily &
  - Monitor winter sown containers occasionally

Resources

Arlington Food Assistance Center, Plot Against Hunger Program
https://afac.org/plot

Arlington Central Library, 1015 N Quincy St, Arlington, VA 22201

- **Garden Talks** – Wednesdays 7pm-9pm – March through October

Master Gardeners of Northern Virginia – https://mgnv.org/

- Select On-Line References for Kitchen Gardening (Resources)
- Between the Rows Newsletter, A Guide to Vegetable Gardening (Resources)
- Virginia Extension / MGNV Classes in Arlington & Alexandria (Events)

Gardeners…

- Volunteer at a Giving Garden
- Enjoy the Company of Other Gardeners

Upcoming Garden Talks – 7pm Central Library

- March 13: Vegetable Garden Design for Success
- March 20: Intensive Gardening How-To
- March 27: Fruit for your Garden – Trees, Bushes & Brambles
- April 3: Planning & Planting Your Herb Garden
- April 10: Balcony and Container Gardening Basics