



Spring into Gardening

A program of  **Citizens' Greener Evanston**
Act Locally. Breathe Globally.

What to Sow When to Maximize Yield



March 7, 2020

Evanston Ecology Center, 2024 McCormick Blvd.

Our Vision

Inspiring and supporting a culture of sustainable food growing and sharing throughout the Evanston community.



Our Initiatives

- Eggleston Park Food Forest
- Produce Sharing
- Growing New Gardeners
- Education & Outreach



Get Involved

We are an all-volunteer non-profit organization.
(a program of Citizens' Greener Evanston)

We welcome individuals in the community
(in and around Evanston) to join us with their
physical, mental and financial support.

How can YOU get involved?

Attend a quarterly meeting to find out more about
the whole organization, or join one of our initiatives...



Food Forest

The Eggleston Park Food Forest is a diverse planting of trees, shrubs and small plants using permaculture principles.

Volunteer:

- **Work & Laugh** the first Tuesday of each month
from 5 p.m.–7 p.m.
Includes updates from our raised-bed growing experiment
- **Work & Learn** the third Saturday (usually):
Class 10:30 a.m.–11 a.m.
Volunteer 11 a.m.– 1 p.m., each month



Produce Sharing

- Connects individual growers to food pantries to get excess produce to those in need
- Volunteers needed to pick up and deliver produce
- Donate all summer long at your community garden or McCormick, Twiggs or Ridgeville for home gardeners



New Gardener

- New Gardener mentoring
 - Experienced gardeners mentor our new trainees
- Help install gardens

Local Food Education

- A focus on food and the climate through the lens of Permaculture
- 2020 Theme:
Creatively Use and Respond to (Climate) Change
 - We teach practical classes about urban agriculture and gardening all year
 - Distribute free seeds each spring—today!
 - We need your expertise
 - We welcome your ideas and feedback as to at what level classes should be taught





Getting more from your garden *and a note on “Yield”*

Permaculture’s Ethics of Earth Care, People Care, Fair Share should be considered in yield

- Yield should be about bounty, not greed.
- Improving soil life and fertility, caring for beneficial insects are a “yield.” (And certainly not harming the environment is crucial.)
- Growing healthy produce, sharing it, and getting joy and mental health is a yield.
- Sharing with people, and also a bit with other critters, is good!



Introduction

Goals

- Get as much produce from your garden as possible
- Grow a diversity of produce spaced over a longer period of time
- Care for your soil

Techniques

- Understand timing and cultural needs
- Learn about Succession, Inter-cropping, and Polyculture
- Know the characteristics of your plants
- Embrace the diversity of edible crops we can grow in our climate
- Realize the value of planning and record keeping skills

Donate excess to Edible Evanston's produce sharing program!



The Basics of When to Start What ... and Why

- Know when to plant out transplants:
Either side of the first frost-free date *based on variety*
- Plan to start seedlings based on how many weeks in advance you need to sow to get ideal size plants for transplant date
- How to use the Spring Sowing seed starting chart



Spring Sowing & Planting Dates

Vegetables

from http://www.johnnyseeds.com/e-pdgseedstart.aspx?source=W_InteractiveTools_122014

Enter spring frost-free date (include year):				5/10/2016^		
Crop: Sorted by when to start	Number of weeks to start seeds before setting-out date	When To start inside		Safe time to set out plants (relative to frost-free date)	Setting-out date	
		From	To		From	To
Onions	8 to 10	2-Feb	16-Feb	4 weeks before	12-Apr	
Parsley	9 to 10	9-Feb	23-Feb	2 to 3 weeks before	19-Apr	26-Apr
Leeks	8 to 10	16-Feb	1-Mar	2 weeks before	26-Apr	
Peas*	3 to 4	16-Feb	8-Mar	6 to 8 weeks before	15-Mar	29-Mar
Corn salad/mache	4 to 6	16-Feb	22-Mar	3 to 6 weeks before	29-Mar	19-Apr
Spinach	4 to 6	16-Feb	22-Mar	3 to 6 weeks before	29-Mar	19-Apr
Celery & celeriac	10 to 12	23-Feb	8-Mar	1 week after	17-May	
Collards	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Kale	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Kohlrabi*	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Mustard*	4 to 6	1-Mar	15-Mar	4 weeks before	12-Apr	
Cabbage	4 to 6	1-Mar	12-Apr	4 weeks before	12-Apr	10-May
Lettuce	4 to 5	8-Mar	22-Mar	3 to 4 weeks before	12-Apr	19-Apr
Beets*	4 to 6	15-Mar	29-Mar	2 weeks before	26-Apr	
Broccoli	4 to 6	15-Mar	29-Mar	2 weeks before	26-Apr	
Swiss chard	4 to 6	15-Mar	29-Mar	2 weeks before	26-Apr	
Eggplant	8 to 10	15-Mar	5-Apr	2 to 3 weeks after	24-May	31-May
Cauliflower	4 to 6	15-Mar	12-Apr	2 weeks before	26-Apr	10-May
Artichoke	8	15-Mar		on frost-free date	10-May	
Tomatoes	6 to 8	22-Mar	12-Apr	1 to 2 weeks after	17-May	24-May
Peppers	8	29-Mar		2 weeks after	24-May	
Basil	6	5-Apr		1 week after	17-May	
Corn*	2 to 4	12-Apr	10-May	0 to 2 weeks after	10-May	24-May

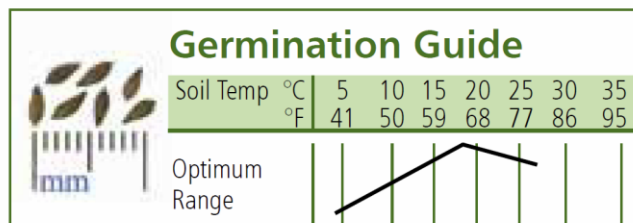
Things to Consider When Starting Plants

- Temperature, including frosts and differing cultural needs for cool & warm conditions
- Light levels
- When to direct sow
vs. when to use transplant starts

Soil Temperature

- Soil temperature needed for germination *per plant type* is available in catalogs from superior suppliers.
- High Mowing and Fedco have useful charts
- Johnny's has detailed graphs throughout catalog

LETTUCE



Planting Chart



Cut out this page & bring it with you!

*Spacing requirements may vary. Due to the wide variety of tools and techniques available to both gardeners and commercial growers, this chart should only be used as a guide.

CROP TYPE	Seeds/Unit, M=1,000	Plant Spacing for direct sowing or transplanting	Seed Planting Depth	Row Spacing	Direct Sow or Transplant	Soil Temp (°F) for germination	Start Transplants (before setting out)	When to Plant Out
Artichokes	625/oz	12-24"	1/4"	5'	TP	60-80°	10-12 weeks	After last frost
Bean, Bush, Dry	75-220/oz	8 seeds/foot	1"	18-30"	DS	60-80°	n/a	After last frost
Bean, Bush, Snap	75-220/oz	8 seeds/foot	1"	18-30"	DS	60-80°	n/a	After last frost
Bean, Pole	75-220/oz	8 seeds/foot	1"	5'	DS	60-80°	n/a	After last frost
Bean, Soy	75-220/oz	8 seeds/foot	1"	18-30"	DS	70-90°	n/a	After last frost
Beet	1.5-2.5M/oz	15 seeds/foot	1/2"	12-18"	DS	60-85°	n/a	As soon as soil can be worked
Broccoli	5.6-9.4M/oz	10-16"	1/4-1/2"	18"	DS or TP	65-85°	4-6 weeks	After last hard frost
Broccoli, Sprouting	4-9M/oz	3 seeds every 12"	1/2"	18"	DS	50-65°	n/a	After last frost or in late summer
Brussels Sprouts	7M/oz	18-24"	1/4-1/2"	30"	DS or TP	65-75°	4-6 weeks	As soon as soil can be worked
Cabbage, Chinese/Napa	5-9M/oz	10-16"	1/2"					
Cabbage, Fresh Market	5-9M/oz	10-18"	1/2"					
Cabbage, Storage	5-9M/oz	18-24"	1/2"					
Carrot	11-37M/oz	15- 40 seeds/foot	1/4-1"					
Cauliflower	5-10M/oz	12-18"	1/4-1"					
Celery/Celeriac	50-70M/oz	6-10"	1/8"					
Chard, Bunching	1.2-2.5M/oz	8-12"	1/2"					
Chard, Baby	1.2-2.5M/oz	40 seeds/foot	1/2"					
Collards	6-9M/oz	8-12"	1/4-1"					
Corn	100-200/oz	2 seeds every 12"	1-2"					
Cucumber, Greenhouse	1-1.3M/oz	20"	1/2"					
Cucumber, Pickling	1-1.3M/oz	8-12"	1/2"					
Cucumber, Slicing	1-1.3M/oz	12-24"	1/2"					
Eggplant	5.5-7.5M/oz	12-18"	1/4"					
Fennel	5-7M/oz	6-8"	1/4-1"					
Garlic, Softneck	50 cloves/lb	6"	2" w/ 3-4"					
Garlic, Hardneck	40 cloves/lb	6"	2" w/ 3-4"					
Greens, Baby Leaf/Salad	16-24M/oz	60 seeds/foot in 2-4" bands	1/8"					
Greens, Arugula, Full Size	15M/oz	60 seeds/foot in 2-4" bands	1/4"					

Soil Temp (°F) for germination	Start Transplants (before setting out)	When to Plant Out
60-80°	10-12 weeks	After last frost
60-80°	n/a	After last frost
60-80°	n/a	After last frost
60-80°	n/a	After last frost
70-90°	n/a	After last frost
60-85°	n/a	As soon as soil can be worked
65-85°	4-6 weeks	After last hard frost
50-65°	n/a	After last frost or in late summer
65-75°	4-6 weeks	As soon as soil can be worked
70-95°	3-5 weeks	When nights are at least 50°F

Warm vs. Cool Crops

Some plants thrive in cooler air and some require warmth to thrive. Trying to grow out of season can stunt growth or just not succeed.

- *Frost-tolerant cool-season crops*

- Asparagus, Broad Beans/Fava Beans, Broccoli, Brussel Sprouts, Cabbage, Collard, Garlic, Kale, Kohlrabi, Leek, Lettuce, Onions, Peas, Radish, Spinach, Turnip

- *Cool-season crops affected by frost*

- Beets, Carrots, Cauliflower, Celery, Chard, Chinese Cabbage, Mustard, Parsnip, Potato, Swiss Chard

- *Warm season crops which need heat*

- Basil, Beans (Bush Snap, Pole & Dry), Cucumber, Eggplant, Melons, Peppers, Pumpkins, Squash, Sweet Potato, Tomatoes

Seeing the light

In our region light level, even more than temperature, can be the limiting factor for frost-tolerant crops from late October through mid-February.

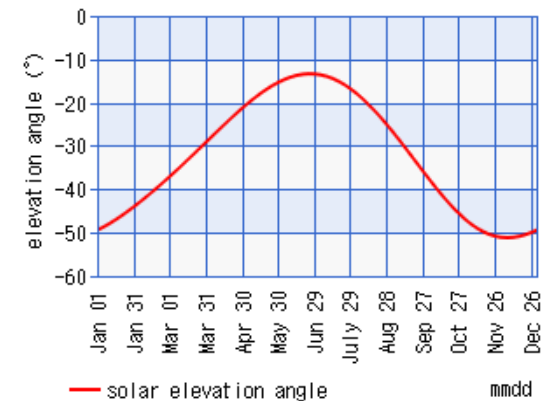
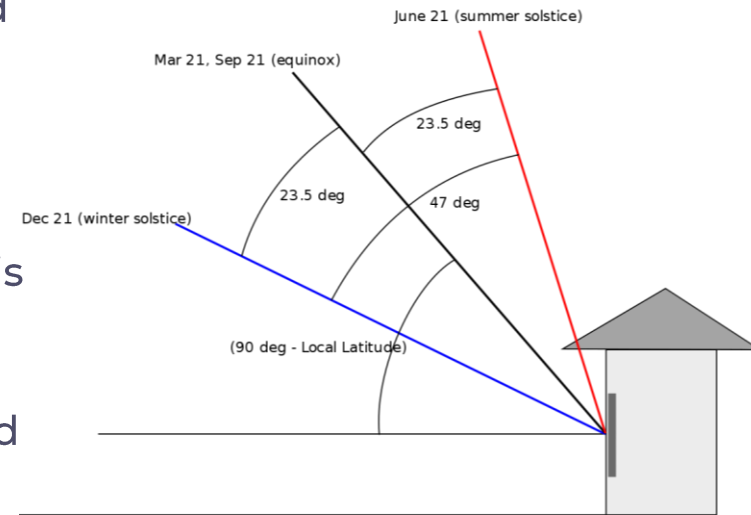


Location	Day Length at Summer Solstice	Day Length at Winter Solstice
Chicago, IL	15 hr 13 min (solar noon: 12:52 pm (71.6°))	9 hr 8 min (solar noon: 11:48 am (24.7°))
Portland, Maine	15 hr, 26 min	8 hr, 55 min
Miami, Florida	13 hr, 45 min	10 hr, 32 min

From February 1 to November 7 in Evanston we get at least 10 hours of sunlight a day, the amount generally considered the minimum for active plant growth. Plants will survive by not grow with less than ten hours.

Shadows

- The sun's angle changes from far south in winter to almost overhead in the summer.
- Trees or buildings south of your garden cast shadows and shade in winter, spring and fall, but area may have bright sun in midsummer.
- Smaller things cast shade, too, including crops you grow. Plan for this when planting fall and spring crops. **Make sure taller crops are to the north** to avoid shadows which may not exist in summer. As we discuss intensive growing techniques, keep these sun angles in mind when planning how crops *might shade each other* while growing.
- Today, in Evanston in early March, when the sun is highest, it's 30 degrees lower in the south than at summer solstice; by late August it's 15 degrees lower to the south again. **So shadows of objects to the south are 3x longer in March and September than at solstice.**
- Consider the sun's influence during the year on creating microclimates. A brick wall to the north or your garden will absorb heat during the day and radiate heat at night.



Historical Frost Date Information

Nearest Climate Station	Altitude	Last Spring Frost	First Fall Frost	Growing Season
CHICAGO BOTANIC GARDEN, IL	629'	May 2	Oct 11	161 days

- NOAA and the State Climatologist Office for Illinois maintain this data.
- Last and first frost dates are 30% probability. Calculated using 1981-2010 “Climate Normals.”
- Latest date for 32 degrees at CBG was May 27 (1981-2010)
Latest date for 28 degrees at CBG was May 3 (1981-2010)
- Your garden’s microclimate may vary from this.
Wind and low areas (frost pockets) make a huge difference.
- Different plants need different levels of warmth to survive and to thrive.
Some are fine with 28 degrees. Others will suffer if less than 35.

Two Approaches:

direct sow vs. transplant

When to Transplant

- **Spring transplants:**
 - Long-season warm veggies like tomatoes, peppers and eggplant require climate-controlled head start
 - Controlling soil temperature and moisture provides predictable germination for a wide range of plants.
 - Avoiding wind and frost damage and pest pressure gives plants a most secure start
- **Summer and fall transplants:**
 - When your garden is full of larger plants, you can start replacements inside
 - When conditions outside are too hot and dry, you can get plants to germinate inside



Direct Sow Advantages

- Less disturbance
- Fewer supplies, energy/inputs, work
- Easier to insert into a row

Best to start outside (either):

Beans, **Beets**, Carrots, Cucumber, Garlic, Gourds, Melons, Okra, Peas, Pumpkins, Radish, Rutabaga, Shallot, Squash, Turnip, Zucchini

Best to start inside (either):

Basil, Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Chives, Dill, Eggplant, Greens, Kale, Kohlrabi, Leeks, Onions, Parsley, Peppers, Rhubarb, **Spinach**, **Swiss Chard**, Tomatillo, Tomato, Most Herbs

Direct vs. Transplant Considerations

- To maximize yield, sow most of your spring starts inside; tap-root veggies are an exception, especially carrots
- Depending on conditions, direct-sown plants *might* catch up to transplants.
- With direct sow— if there's uneven germination—you can end up with gaps where you wanted a plant or a need to thin where too many germinated.
- If you have problems with slugs (or cutworms) transplants are more likely to survive while direct-sown tiny seedlings may get devoured.
- Later in the season having transplants ready to go—to “pop in”—can improve use of space and yields. Can be done as part of a plan, but also is an insurance policy for crop failures.
- Summer lettuce and spinach and cilantro may be easier to start in the cool of a house or basement.



Comparison of Square Foot Gardening *to the following techniques*

- You may be familiar with this popular technique—where you divide your garden in a grid, plant different crops in the various grids, and replant grids as you harvest them.
- You will see that this idea borrows several techniques from the below methods.



Succession

Basic methods and reasons

- Sow smaller amounts of some crops on a regular basis
- Sow early cool weather crops followed by warm weather crops
- Sow spring cool weather crops followed by fall cool weather crops
- Sow multiple sowing to avoid disease/keep vigor
- Plant several varieties of the same crop which mature in a different number of days

Multiple sowings of something on a regular basis

A garden is, frankly, not a “set it and forget it” thing, especially if you want to grow leafy greens.

The goal should be to have a continuous fresh supply that’s enough for your household, but not more than you can handle.

This means a grow less, more often.

- Most greens tend to bolt, don’t store terribly well, and crop rather quickly. Frozen lettuce? Canned lettuce? Dried lettuce? Um, no!
- Don’t end up with too much of one thing.



Above: NO! Don’t end up with too much all at once

Below: Better! Multiple rows started over time, but still too much lettuce



Multiple Sowings on a Regular Basis examples

- The classic example is to sow **lettuce** every two weeks
 - In summer grow in part-shade or under shade cover in the summer, or switch to heat tolerant varieties
- Another obvious example is **radish**.
- A third is **arugula**. Another is **cilantro**.
- Sow *a third of a row* of three things, for example, instead of full rows, and start another row every week or two.



Lettuce extended harvest tip: grow leaf lettuce, or a more open head variety. Then harvest all outer leaves from several plants continuously instead of growing to cut one tight head.

Plan for Continuous Supply

- Market gardeners use a chart like the following to plan for a continuous supply using multiple rows (and you can do something similar using portions thereof)
- Figure the last date to plant based on *the days from seedling to maturity*, the length of harvest period, and your frost date.

Variety	Days to Maturity	Interval Between Successions (days)	1st Planting	2nd Planting	3rd Planting	4th Planting	5th Planting	6th Planting	7th Planting	8th Planting	Final Planting Date*
Beans	55	10	05/01/20	05/11/20	05/21/20	05/31/20	06/10/20	06/20/20	06/30/20	07/10/20	08/03/20
Beets	50	14	05/01/20	05/15/20	05/29/20	06/12/20	06/26/20	07/10/20	07/24/20	08/07/20	08/08/20
Cucumbers	60	21	05/01/20	05/22/20	06/12/20	07/03/20	07/24/20	08/14/20	09/04/20	09/25/20	07/29/20
Kale/Collard	60	21	05/01/20	05/22/20	06/12/20	07/03/20	07/24/20	08/14/20	09/04/20	09/25/20	09/11/20
Lettuce, Full-size	55	14	05/01/20	05/15/20	05/29/20	06/12/20	06/26/20	07/10/20	07/24/20	08/07/20	08/17/20
Lettuce, Salad Mix	28	7	05/01/20	05/08/20	05/15/20	05/22/20	05/29/20	06/05/20	06/12/20	06/19/20	09/13/20
Melons	70	21	05/01/20	05/22/20	06/12/20	07/03/20	07/24/20	08/14/20	09/04/20	09/25/20	07/19/20
Radish	26	7	05/01/20	05/08/20	05/15/20	05/22/20	05/29/20	06/05/20	06/12/20	06/19/20	09/15/20
Spinach	40	7	05/01/20	05/08/20	05/15/20	05/22/20	05/29/20	06/05/20	06/12/20	06/19/20	10/01/20
Summer Squash	48	42	05/01/20	06/12/20	07/24/20	09/04/20	10/16/20	11/27/20	01/08/21	02/19/21	08/24/20
Basil, Genovese	68	14	05/01/20	05/15/20	05/29/20	06/12/20	06/26/20	07/10/20	07/24/20	08/07/20	07/21/20
Cilantro, Santo	50	14	05/01/20	05/15/20	05/29/20	06/12/20	06/26/20	07/10/20	07/24/20	08/07/20	08/22/20

Cool followed by Warm followed by Cool

Sow early cool-weather crops followed by warm-weather crops

Use the number of days to maturity and the crops' desire for cool vs. warm weather to plan plantings where different crops follow each other

- For example, spring spinach can be followed by summer bush beans; then plant kale in August for fall use.

Sow cool-weather crops in early spring, and again in late summer for fall crops.

- The fall crop of greens can follow earlier planting of early cucumbers or could follow something like beets or potatoes or onions, which could have been either spring or early summer plantings.
- Fall greens are much less likely to bolt, although sometimes hit by an early frost.
- Many fall greens are hardy and will be sweeter with a light frost; some will survive most winters and be a delight in early spring.

Plan for Disease and Reduced Vigor

Having a new group of vigorous plants lets you pull the diseased ones and gives you more of a continuous supply

- Plant multiple sowings of cucumbers to deal with their susceptibility to disease. If you expect this to happen you can pull weak plants and still enjoy cucumbers until fall.

Most vegetables produce heavily and then slow down

- Bush beans, unlike pole beans, crop well for about two weeks and then slow down. Plant fewer plants at a time but plant every two weeks. Time this without a calendar by starting a new sowing when your last one has developed its first true leaves.

Timing can avoid disease pressure

- Squash borers are much less active by mid-July. Make a second sowing of summer squash in late June to avoid borer.
- Flea beetle pressure is reduced by mid-July. Radish and collards will have less flea beetle damage if started in June.

Consider Rotation

Keep rotation in mind.

If possible don't keep planting the same family of plants in the same soil time and time again. Rotation can potentially prevent disease and avoid extracting too much of one type of nutrient from the soil.

Few of us have large enough gardens to really make this possible, so don't stress over it.

Interplanting/Undersowing/Intercropping

These are all similar techniques which combine different plants into your rows of crops and work with plant timing and cultural needs.

To do this well we need to keep in mind temporal space, physical horizontal and vertical space—*both up and down*—as well as the need for light, moisture, and both the nutrient *requirements* and the potential soil *benefits* of crops.



Interplanting Food Crops

Consider Roots

The vertical (and horizontal) space includes roots.
Prevent competition for space and nutrients.

Example Combination

- Leeks and onions don't have much spread above ground, but their roots do reach out
- Beets and carrots and turnips are tap rooted, so their roots go straight down but their tops spread out.
- You can plant a row of onions between these tap-rooted crops with only a *little* more row spacing needed.



Young leeks interplanted
with carrots and brussels
sprouts.
Will Bonsall photo

Interplanting Food Crops

Maximize bed space use

Sometimes intercropping is about growing and harvesting a quick crop *next to* a crop that starts very slowly to better use the space.

- A classic example is combining radish with carrots because carrots germinate very slowly and radish crop completely very quickly.
- It's a common practice to grow a very few radish seed in a carrot row to mark it and help break the soil. But the carrots don't need the 12 inches between rows until they begin to mature, so you can sow a full row alongside the carrots to be harvested early if you are a radish fan! (Radish like to be grown in 7-inch on-center rows minimum, so you can sow them 3.5 to 4 inches from the carrots; sow one or two rows of radish between two rows of carrots)
- If you prefer green onions, do one row of those in between.
- Twist them out when ready and let the carrots fill in the space.



Interplanting Food Crops

Temporal combinations

A similar idea is combining cold tolerant plants with those which are heat loving.

- Start your peas with gaps every 15 to 20 inches; once the peas are in flower you can plant your tomato transplants in those gaps; the peas finish before the tomatoes are large enough to need the space and then can rapidly fill in once the weather warms.



Use space between slow-growing young plants which will remain in the garden a long time. Grow an additional quick crop before they need space.

- With cabbage or celery transplant lettuce or spring onions in between these wide-in-row-spaced plants.
- Avoid future crowding of these slow-growing seedlings by giving them the room they will eventually need while using the space between young plants to get a crop of lettuce.
- Twist out the lettuce after last harvest and/or when the long-term crop needs the space.

Charles Dowding: Interplant of spring onion and celeriac all planted mid May



Interplanting Food Crops

Temperature control

Sow spinach in the fall for winter spinach or in the spring once the soil temperature hits 50 degrees. Then, once the soil is about 70 degrees, inter-sow bush beans between your existing rows of the cool-loving spinach.

- The spinach will protect the soil and keep it warmer to get the beans started.
- Once the spinach starts to bolt, pull it to allow the heat-loving beans to take the remaining space.

Later in the year you can flip this idea on its head:

- Sow spinach seeds (or chard, or kale) *in between* your late-summer beans for your fall/winter greens. The spinach seedlings will appreciate the cooler, moist soil between the bean plants—and the nitrogen fixed in the beans' root nodules—as well as shade and protection from summer heat.

Lettuce enjoys cool wet weather and seldom thrives in summer heat, but you can use the natural shade of other plants you are growing to create a microclimate for interplanted lettuce.



Interplanting Cover Crops

Caring for the soil may be the most critical thing we can do as gardeners, and the best way to do that is to keep a living root in the soil year-round.

- When you are ready to pull your crops in the fall it may be too late to get a new cover crop to germinate. The answer is **undersowing**. In early fall broadcast your cover-crop seed right under your current garden crops. It will germinate and stay small, waiting patiently for you to twist out or cut your crop plants and then grow to protect the soil and feed the soil life through the winter.



Interplanting Cover Crops

Use a similar technique by **undersowing summer covers**. This way you protect the soil around your crops, prevent weeds, reduce both soil erosion and the accompanying splash of soil with fungal spores onto the leaves.

- My favorite is annual crimson clover under squash plants, which also feeds the bees and harbors nitrogen-fixing bacteria in their root nodules. A carpet of clover surrounds the baby squash plants. The squash will become huge and shade out both the clover and any future weeds, leaving the soil weed-free. The soil remains covered by the clover.
- In the above squash example, you *could* add a crop for consumption in addition or instead of the clover, but it's harder to time it well. How fast will those squash plants grow since they are very, very heat dependent? It's ok to try something "extra," like a band of radish.



Polyculture

Polyculture is a variation of interplanting but combines more vegetable types together and entirely abandons the idea of a “row” of something.

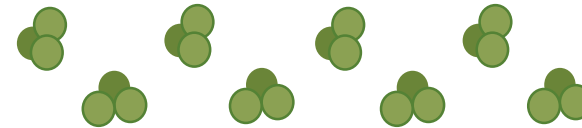
- The diversity of groups has an advantage because the crops will tend to both pull somewhat different nutrition from the soil and occupy different niches both in the root zones and in the air.
- Polycultures are slightly less susceptible to pests because you don't have a monocrop.



Multi-sowing

Multi-sowing is just a very, very different approach to thinning and spacing, but still generally is planted in normal rows.

Groups fit best if staggered in their rows:



Multi-sowing works surprisingly well for crops like beets and radish, chard, spinach, onions and leeks.

The idea is to sow a few seeds together (3 to 6). When planting out, *do not thin*, but leave large gaps between groups, resulting in more plants per sq. ft.

Harvest over a period of time, removing the largest ones early by twisting them out. Let the smaller ones keep growing in the remaining larger space.

You get a longer harvest without replanting the area and without having everything ready at once. Surprisingly, some plants (beets, I know) actually prefer the close company!



Know When It's Time

to pull and remove a crop and be prepared with a new one

It can be hard to know when to move on and consider a crop “finished.”

To get both the best yield and the best flavor from your garden, recognizing—*and better yet anticipating*—that point will make you a much better gardener.

If you can also be prepared to use the space, you will get the most benefit (and less pain if you are a softy like me!)



Bolting: You have a crystal ball

When a plant we grow for leaves starts to work on flowering, it shifts the sugars and energy from those leaves into the flower formation and changes the chemistry of the leaves, making them bitter.

We can predict things which make many crops bolt. Knowing it's going to happen means we can have a new crop ready to fill in that space.

- Spring spinach is BOUND to bolt before solstice.
- Overwintered brassicas will flower in June.

Lettuce produces sesquiterpene lactones which evidence shows are very good for human health—so embrace the bitter!



Bolting: You have a crystal ball

You will become more aware of the **change in plant form** and know bolting is just days away.

- Most plants that are moving from leaf to flower production begin to elongate.
- When you see lettuce or spinach start to get taller (not wider) suddenly, you know it's time to harvest what you have and cut your losses.



Why they Bolt and What to Do About It

Too little sleep and stress!

The biggest triggers for bolting are stress and day length.

Stress causes plants to focus on reproduction

- Common factors are lack of water, reduced spacing, poor soil health, etc.

Plants native to non-equatorial regions are sensitive to **day length** (actually, it's night length).

- Many are triggered to flower by shortening nights (longer days)
- A few are triggered by shortening nights, so after solstice.
- If you interrupt the darkness, you will disturb the cycle.

A few controls for daylength-based bolting

- Pinch or cut back brassicas regularly to force them back into vegetative mode.
- Very young plants too small to set flower will often not bolt.
- Plant very early (under protective cover) *or* wait until after solstice. And use the space in your garden wisely knowing bolting is likely to occur.

Prevention by substitution

- Plant spring chard instead of spinach and plant your spinach in August.

Pinch back your flowering 2nd year kale and eat the delicious flowers.

They may then revert to leaf production.



Photoperiods: The Long and the Short of it

- Long-day plants want to flower as we move toward the longest days of the year. A **long-day** plant requires >12 hours of sunlight— or <12 hours of *uninterrupted* darkness—to produce a bloom or flower.
- Short-day plants want to flower earlier in spring or in fall. A **short-day** plant requires <12 hours of sunlight, or >12 hours of *uninterrupted* darkness, to produce a bloom or flower.
- Plants that disregard the day length and determine their flowering on factors such as temperature or the stage of maturity are called **day-neutrals** and do not initiate flowering based on photoperiods.

Long Day Plants (Day Length > 12 hrs)		Short Day Plants (Day Length < 12 hrs)	Day Neutral Plants (Ignores Day Length)
artichoke	lettuce	black-eyed peas	apples
barley	oats	blueberries	apricots
beets	onions	cotton	Brussels sprouts
carrots	peas	mung beans	cabbage
cilantro	potatoes	raspberries	corn
clover	radishes	rice	cucumbers
dill	rye grass	soy beans	kale
fennel	spinach	sugar cane	peaches
flax	turnips	sweet potatoes	pears
lentil	wheat		tomatoes

References

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www.highmowingseeds.com/pub/media/wysiwyg/pdf/2018_Planting_Chart.pdf

Pam Dawling's entire book is available online! (My "bible") —nice to search or print a page or so, but buy the book!

<https://archive.org/details/SustainableMarketFarming>



Answering Your Questions

Any questions?! ??