



Growing & Storing Food at High Elevation

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Wellington, Zone 5B, 5200' 2009-2014 (6 Years)



INTROS

(Show of Hands)

- Do you already have a garden?
- Are you just starting out?
- What's your elevation?
- Do you have a greenhouse? Heated?
- How many off-grid?
- What's your biggest garden concern?



Guffey, Zone 4B, 9000' 2017-Present (8th Year)





Guffey Greenhouse



Guffey Greenhouse















































Why Garden?

(We don't do this to save money!)

- Grow organically & eat our own food.
- Be self-sufficient.
- Produce & preserve as much food as we can.
- We get Vitamin D and exercise!
- We enjoy getting our hands dirty & it's fun.
- We want to honor God by being good stewards of the land He created.

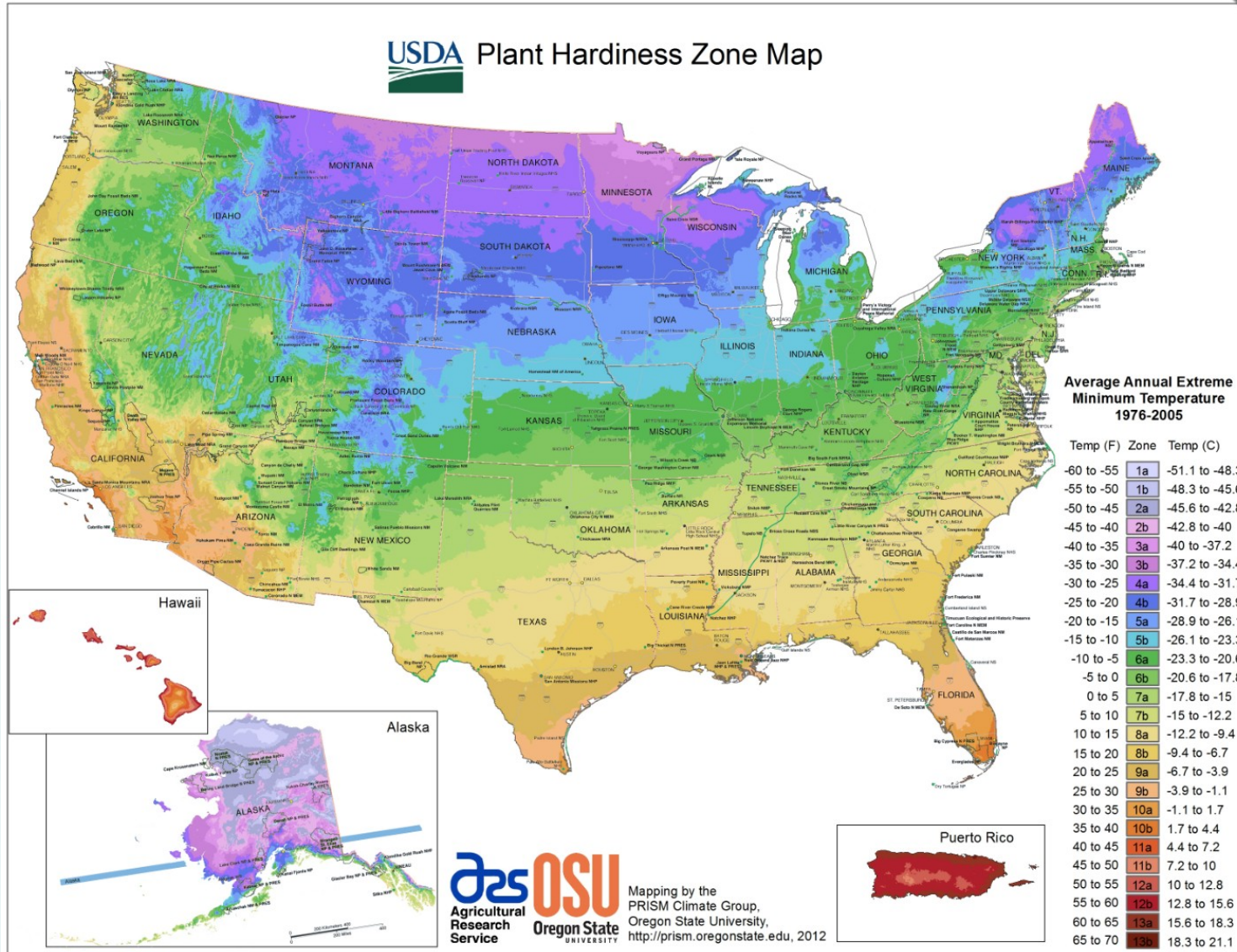


High Elevation Gardens

- High elevation gardens may cost you more \$\$
- It will require more time & effort
- Growing methods may differ
- “USDA Growing Zones” don’t apply
- “Maturity Dates” don’t always apply
- Gardening information is hard to find
- Extension Offices: not very helpful
- It’s a commitment!



USDA Growing Zones



USDA Zones & Stats

Location	Zone	Last	First	# Days	July	Hrs 6/21
Westcliffe	5 a-b	June 18	Sept 4	78	37-93°	14:49
Guffey	4 b	June 9	Sept 15	98	35-92°	14:53
Bemidji, MN	3 b	May 22	Sept 24	125	42-91°	15:57
Fairbanks, AK	2a-3b	May 21	Sept 15	103	46-90°	21:49

- Some things sold as “Hardy to Zone 3” may not grow well in Zones 4 or 5.



High Elevation Observations

GUFFEY LAST & FIRST DAYS: FROST & SNOW

LAST DAY <= 32

	LAST F°	FIRST F°	#Days Between	# Wks
2023	6/18 32°	9/16 30.2°	90	12.86
2022	6/4 32°	9/11 28	100	14.29
2021	6/1 29°	9/18 31.8°	110	15.71
2020	7/1 31°	9/8 22°	69	9.86
2019	6/23 30°	9/13 31°	82	11.71
2018	6/25 30°	9/21 31°	88	12.57
2017	6/3 32°	9/21 32°	110	15.71
2016	5/31 30°	9/9 32°	101	14.43
2015	5/29 28°	9/19 26°	113	16.14
AVG			96.63	13.80

SNOW

	LAST AMT	FIRST AMT	#Days Between	# Wks
2023	5/11 4"	10/29 2	172	24.57
2022	5/24 28"	10/27 1	156	22.29
2021	5/11 1"	10/12 1.5"	154	22.00
2020	6/9 2"	9/9 8"	92	13.14
2019	5/29 4"	10/10 1.5"	134	19.14
2018	5/3 1"	10/8 1"	158	22.57
2017	5/22	9/28 1"	129	18.43
2016	5/27	10/6	132	18.86
2015	5/22	10/21	152	21.71
AVG			138.38	19.77

- Keep your own detailed weather records
- Last/First dates by zipcode may be unreliable
- USDA Zones: don't rely on them
- Share with each other your observations



High Elevation Climate

- Sun UV: very intense
- Dry, low humidity
- Drought Conditions
- Wind
- Hail
- Snow
- Short Seasons: Last to First Frost
- High temperature swings: 30-90° in 1 day



Garden Location

Looking West from Black Mountain



Garden Location



Garden Requirements

- Water Source: Is your well productive?
 - Cistern
- You WILL need to amend your soil
 - Compost (reuse garden refuse), leaves, manures, vermicompost
 - Fertilizers: organic, non-organic
- Pest/Critter Control
 - Your own livestock, poultry
 - Wildlife: deer, bunnies, squirrels, packrats, mice
 - Bears (??)



Season Extenders



- Plastic over hoops
 - Must not touch plants
- Bottles filled with water



Season Extenders



- Frostcloth
 - Can be laid over plants
 - If snow is expected, don't crush your plants!
 - Use in addition to plastic over hoops



Shade Cloth



- Protects from scorching sun
- Lets 70% light through
- Knit or woven
- Protects from hail or snow



Attachments



- EMT Hoops
- EMT “Rollers”
- Hoop extensions

Clips

- Buy online
- Make yourself
- PVC Sched 30
- Also extenders for EMT



May 21, 2022



Protect Your Garden

- Livestock, Poultry, Wildlife
 - fence
- Birds (only needed for berries)
 - netting
- Rodents
 - stucco netting (chicken wire), barriers, traps, bait stations



Good Fencing

- Deer
- Bunnies
- Other Rodents
- Cats, Dogs
- NOT mice



Stucco Netting
(Chicken Wire)



Mice



Pack Rats



Bait Station



Raised Beds: 28" Tall



From the bottom up:

- 1) Stucco netting: allows drainage
- 2) Rocks (sticks, twigs)
- 3) Layers of: rock-free soil, leaves, manures; finished compost on top
- 4) Black plastic to speed up the composting

- Hoop framework attached to beds
- Stucco netting on sides
- Each bed is level on the ground
 - Along the side they each step down



How To Plan Your Garden

- Terracing if necessary to make level
- Raised Beds: less digging, no bending, easy on back & knees, better soil, weed & pest control, gives you framework to support hoops or trellises
- In-Ground Beds: minimize effort with no-till “lasagna garden”, sheet-mulching (lasagna) above ground
- Rows wide enough for wheelbarrow or tractor
- Potting Bench/Work Area nearby
- Grow Lights/Indoor seedling area



What to Grow at High Elevation

- Every year is different. Get used to it.
- Grow what grows well. You can't grow everything. (Buy your corn.)
- Plan for fresh eating as well as storing the harvest for consumption during the non-growing season and long-term storage.
- Do you have poultry or livestock? Can you supplement their diet? (duck weed)



Veggies to Grow

- ROOT VEGETABLES: potatoes, beets, carrots, parsnips, rutabagas, turnips
- GREENS: lettuces, spinach, chard, mustards (trap plants)
- BRASSICAS: broccoli, cauliflower, cabbages, bok choy, kohlrabi, kale, collards, brussels sprouts (?)
- LEGUMES: beans, peas (perhaps not dry beans)
- SQUASHES: zucchini, some winter squash, pumpkins
- ALLIUMS: Onions, garlic, shallots, leeks
- PERENNIALS: asparagus, rhubarb, some herbs, comfrey



What Doesn't Grow at 9,000'

- Tomatoes (greenhouse or hoop house only)
- Peppers (jalapenos exception)
- Corn
- Berries
- Fruit Trees
- Try some things you're unsure about, and see if they grow!



Best Veggie Varieties

- Find varieties with the shortest maturity range
- For raised beds (with hoops)
 - Get short or compact varieties
- Open Pollinated vs. Hybrids
- Learn to save your own seeds for future supply issues
- Share seeds with friends/neighbors, ask for recommendations
- See highcountryliving.net for recommendations



Growing Methods

- Start your own from seed! Save \$\$.
- Give your veggies a head start by starting indoors before ALFD. (Average Last Frost Date)
- Some veggies may be direct-seeded outdoors, but do better with an indoor start (brassicas, greens).
- Start EARLY indoors: anything that requires a long, warm growing season. (Beans, squashes, celery, herbs, onions, tomatoes)
- Some veggies may be direct-seeded: peas, carrots, parsnips, beets, potatoes. (Watch for freezing potatoes!)



Starting Seedlings

- “Grow Bench” with lights, heating mats, timers
- Can be indoors, in a basement, in a greenhouse
- Start seeds prior to “Average Last Frost Date” according to recommendations
- Start in peat pots, plug trays, small containers
- Soil Blocks: my favorite method
 - some things traditionally not recommended to transplant may grow well from blocks. (beans)



Potting Bench, Grow Lights



Best Transplants (Tomatoes)



Onions

- Several years of trials
- Best year ordered from Dixondale Onions
- Began growing my own in greenhouse
- Icepick to pencil size is best for transplant
- Transplant in late May, some frost/snow ok
- Be sure to select "Intermediate Day" onions

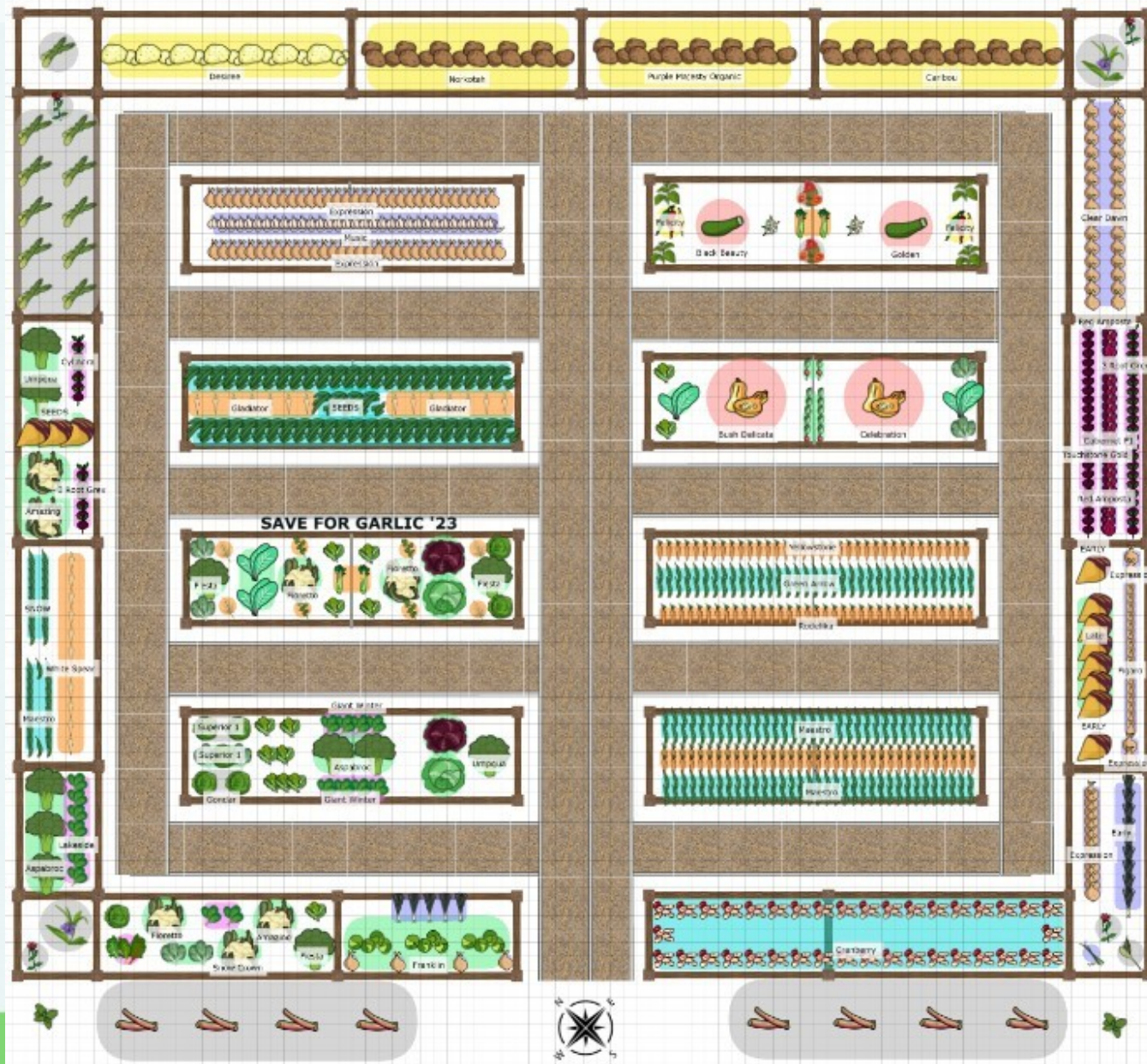


Planning & Record Keeping

- Paper notebook
- Garden Journaling software
- OneNote (Microsoft)
- Spreadsheets
- Garden Maps, Sketches (online or paper)
 - Growveg.com
- Companion Planting
 - see highcountryliving.net



Garden Planner (\$30) growveg.com



Greenhouse + Front Bed



Annual Records

- Plant progress
 - When seeds sown, how long to sprout
 - When transplanted, location
 - First harvest
 - Final harvest, plant removal
 - Notes, observations
- Notes for changes next year
- Weather notes



General Gardening Practices

- Fall: add compost and/or manure to top.
 - Mulch optional.
- Spring: dig in compost/manure, add amendments
- Keep track of what you've done for each bed
- Pay attention to the location of garden authors.
 - Don't assume that what works for them will work for you. e.g. hilling for squash



Garden Map Numbered Beds

NE COR- NER	BOTTOM 1	BOTTOM 2	BOTTOM 3	BOTTOM 4	COM- FREY
EL 4	INTERIOR LEFT 4		INTERIOR RIGHT 4		ER 4
EL 3	INTERIOR LEFT 3		INTERIOR RIGHT 3		ER 3
EL 2	INTERIOR LEFT 2		INTERIOR RIGHT 2		ER 2
	INTERIOR LEFT 1		INTERIOR RIGHT 1		
EL 1					ER 1
COM- FREY	TOP LEFT 2	TOP LEFT 1	TOP RIGHT 1	TOP RIGHT 2	HERBS



Planting

- Transplant Seedlings
 - Prepare soil and deep water the day before
 - Makes soil easier to work with
 - Less pressure to water immediately
 - Don't water soil blocks the day you'll transplant them
 - Add fertilizer with mycorrhizae in the hole
 - "Fungi that have a symbiotic relationship with the roots of many plants."
 - Liquid, water soluble, dry granules
 - Water well
- Direct seed: water carefully, don't disturb seeds



Favorite Fertilizers & Amendments

- Espoma Bio-Tone or Down-To-Earth Bio-Live (these include mycorrhizae)
- Eggshells or gypsum (provide calcium)
- Epsom Salt (provides magnesium)
- Molasses (horticultural molasses at garden centers is cheaper; dry or liquid)
- Wood Ash (especially good for root vegetables such as carrots, parsnips, beets & legumes)
- Finished compost (if not previously added)



Watering

- Hand watering
 - Do this especially when plants are small or unsprouted
 - Doesn't disturb small seeds
 - Helps you keep an eye on things, relaxing
- Overhead watering
 - discouraged, but I do it
- Drip systems, soaker hoses
 - Expensive
 - May deteriorate from sun damage
- Use timers, but supervise



Insects: Outdoors (Not many!)

- Bees: not enough
 - Hand pollinate
 - “Bumble Flower Beetle”
- Cabbage Worms
- Grubs (from manure)
 - Not destructive, use beneficial nematodes
- Leaf Miners
 - beneficial nematodes (arbico-organics.com)
- Aphids



Insects: Greenhouse

- "Pill" Bugs
 - collars around seedling stems
 - Sluggo Plus
 - Hand pick, squash Rinds upside down
- Fungus Gnats
 - "Mosquito Bits"
- Aphids, primarily on brassicas (mustards)
 - Neem spray, Wash off with stream of water
 - Feed the ducks



Compost & Vermicompost

- Our composting method: composter (2-3 Weeks)
 - Garden refuse: small pieces
 - Kitchen scraps, coffee grounds (coffee shops)
 - Poultry shavings (feathers, poop)
 - Leaves, hay, grasses (without seeds if possible)
 - Horse, cow manure (preferably aged)
 - Rock-free soil
 - Comfrey (plant lots of it!)
- Vermicompost
 - Worm bin



Comfrey



Greenhouse Options

- Unheated greenhouse
 - Cold-tolerant foods early spring & late fall
 - summer tomatoes, peppers, squash, cucumbers
- Heated greenhouse (think solar heat!)
 - Can grow food year round to extend season
- Reduces your need to can/freeze/etc.
- Provides space to start seedlings for outdoors

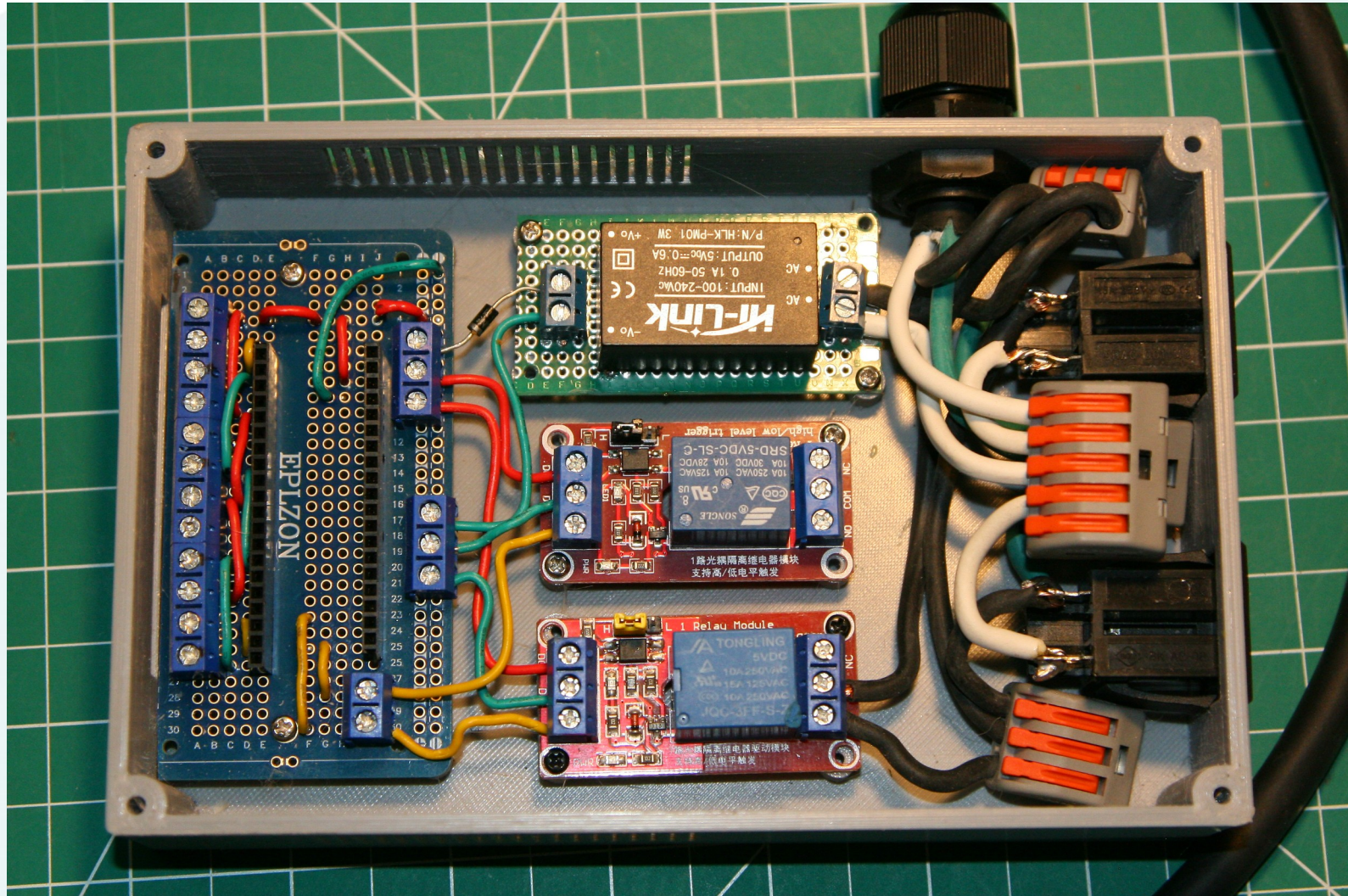


Our Greenhouse

- Heated, stays above 55°
 - ~~In-floor heat~~
 - Needs warm air temperature
 - Radiator uses hot water from solar collector
- Mass heat storage: soil, concrete, water
- Venting: beeswax pistons for overhead vents, door, fan
- We have a Tim the (Geek) Toolman!



Hydronics System Controller



Greenhouse Considerations

- Raised beds: tall or short; on concrete or dirt, helps thermal mass
- Can use pots, large planters/containers
- In-ground beds (may invite rodents, diggers)
- Hanging baskets & climbing varieties: need tall structure
- Should be near water source; electricity optional
- If Heating: How?
- Ventilation: doors, automatic openers
- Potting Bench inside: work indoors when cold outside
- Solid North wall



Greenhouse Requirements

- Keep the soil in good shape
 - Crop rotation, AMAP
 - Add compost, vermicompost
 - Baby cover crops (1-2 months)
 - Allow periods of rest
- Plan for seasons: timing is a learning curve
 - Summer: tomatoes, peppers, cucumbers & rest
 - Winter: tomatoes, lettuce, spinach, brassicas, misc greens
 - seedling "nursery"
- Mulch: 2 reasons I don't mulch



Greenhouse Cover Crops 4/7

Seeds Sown 3/17



Cover Crops Dug In 4/7



Greenhouse Cover Crops 4/11



Food Storage

- Refrigerator: short term
- Root cellar (cold closet): mid term
- Freezing: longer term
- Canning: longer term
- Dehydrating: longer term
- Freeze drying: up to 25 years



TIMELINE

- Make a timeline for yourself so you aren't overwhelmed in the Spring
 - Computer spreadsheets
 - Paper
 - Printed Monthly calendar
- See Handout on highcountryliving.net



	A	B	C	D	E	F	G	H	I	J	K	L		
1	SPECIES		VARIETY		DAYS HOW START		WEEKS DAYS		TRANSPLANT		TARGET HARVEST		NOTES	
2	FIRST FROST		9/15/2020						OUTSIDE		DATE	DATE		
3	LAST FROST		6/15/2020						INSIDE	INSIDE	OR START OS	OUT	EST	
4	ALLIUM	OW-ONION-RED	F1	Desert Sunrise F1	100	BLKS	8/30	10	70	OUT-FALL	11/8	2/16	overwinter in	
5	ALLIUM	OW-ONION-STORAGE	F1	Gate Keeper F1	250	BLKS	8/30	10	70	OUT-FALL	11/8	7/16	overwinter in	
6	ALLIUM	GARLIC	OP	Music			11/1			OUT-FALL	5/1	9/1		
7	ALLIUM	LEEK		Bleu de Solaise	110	GH	2/1	13	89	2-4 BLF	5/1	8/19		
8	ALLIUM	LEEK		King Sieg	110	GH	2/1	13	89	2-4 BLF	5/1	8/19		
9	ALLIUM	ONION-GREEN		Evergreen	65	GH	2/1	13	89	2-4 BLF	5/1	7/5		
10	ALLIUM	ONION-GREEN		White Lisbon	60	GH	2/1	13	89	2-4 BLF	5/1	6/30		
11	ALLIUM	ONION-RED	F1	Desert Sunrise F1	100	GH	2/1	13	89	2-4 BLF	5/1	8/9		
12	ALLIUM	ONION-RED	F1	Cabernet F-1	90	GH	2/1	13	89	2-4 BLF	5/1	7/30		
13	ALLIUM	ONION-STORAGE	F1	Expression F-1	98	GH	2/1	13	89	2-4 BLF	5/1	8/7		
14	ALLIUM	ONION-STORAGE	OP	Dakota Tears	112	GH	2/1	13	89	2-4 BLF	5/1	8/21		
15	ALLIUM	ONION-STORAGE	F1	Gate Keeper F1	250	GH	2/1	13	89		5/1	1/6		
16	ALLIUM	SHALLOT (BANANA)	OP	Figaro	125	GH	2/1	13	89	2-4 BLF	5/1	9/3		
17	MISC	CELERY	OP	Tango	84	BLKS	3/9	12	84	2 BLF	6/1	8/24	transplant or	
18	FLOWER	ALYSSUM		Carpet of Snow	60	BLKS	3/18	12	84	4-6 BLF (try 10+	6/10			
19	FLOWER	BEE BALM		Panorama Red **		BLKS	3/18	12	84	8-10 BLF	6/10		14-21 days to	
20	BRASSICA	BROCCOLI	F1	Aspabroc F1	56	BLKS	4/3	6	42	4-6 Before TP	5/15	7/10		
21	BRASSICA	BROCCOLI	F1	Fiesta F-1	86	BLKS	4/3	6	42	4-6 Before TP	5/15	8/9		
22	BRASSICA	BROCCOLI	OP	Umpqua	60	BLKS	4/3	6	42	4-6 Before TP	5/15	7/14		
23	BRASSICA	CABBAGE	F1	Katarina F1	45	BLKS	4/3	6	42	4-6 Before TP	5/15	6/29		
24	BRASSICA	CABBAGE	OP	Early Jersey Wakefield	63	BLKS	4/3	6	42	4-6 Before TP	5/15	7/17		
25	BRASSICA	CABBAGE	OP	Red Acre	75	BLKS	4/3	6	42	4-6 Before TP	5/15	7/29		
26	BRASSICA	CAULIFLOWER	F1	Snow Crown F1	60	BLKS	4/3	6	42	4-6 Before TP	5/15	7/14		
27	BRASSICA	CAULIFLOWER	F1	Fioretto 70 F1	65	BLKS	4/3	6	42	4-6 Before TP	5/15	7/19		
28	BRASSICA	KALE	OP	Rainbow Lacinato OP	61	BLKS	4/3	6	42	4-6 Before TP	5/15	7/15		
29	FLOWER	NASTURTIUM		Dwarf Empress of India		BLKS	4/15	8	56	1-2 ALF	6/10		trv early in blk	

- Starting days/weeks calculated from expected transplant date, harvest dates, etc.
- Ability to sort by vegetable or start date, etc.



Questions?

- “R2” page on website will have links to today’s slideset, the Garden Timeline, etc.
- Tour outdoor garden & greenhouse
- Tim’s hydronics & cold closet
- Soil Block demonstration



Soil Blocks

- Some things traditionally not recommended to transplant may transplant just fine (beans, beets, corn). Try them.
- Blocks may be transplanted to a temporary location (greenhouse) before their final home.
 - The block will remain somewhat intact, and easy to transplant.



Soil Blocks: Minis (\$45 Amazon)



Soil Blocks: Maxi (\$116 Amazon)



Soil Blocks: Micros (Amazon \$37)

