4 – Season Vegetable Gardening

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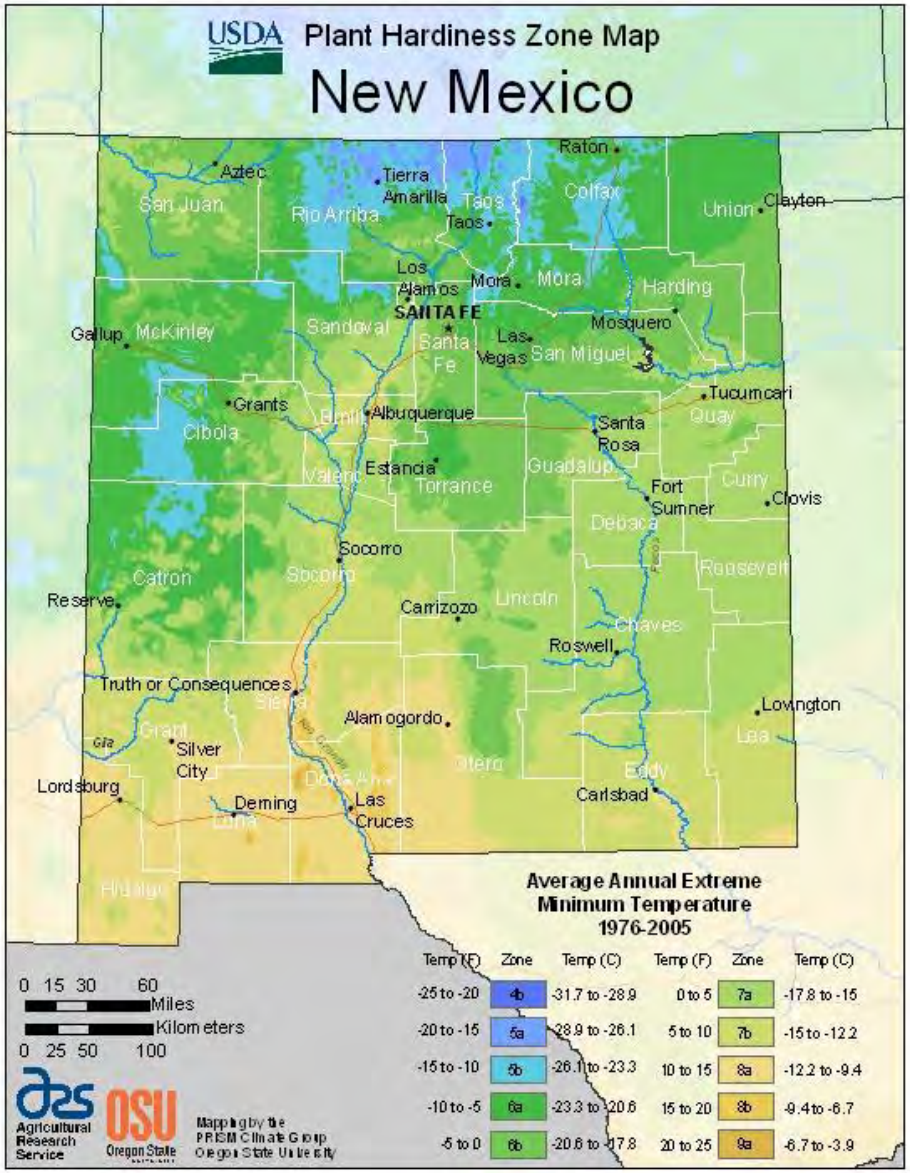


http://planthardiness.ars.usda.gov/PHZMWeb/

NM Number of Frost Free Days

- New Mexico is a large, diverse state

- Area 1: more than 180 days (Las Cruces, Lordsburg)
- Area 2: less than 180, more than150 days (Albuquerque, Santa Fe, Roswell)
- Area 3: less than 150 days (Farmington, Gallup)

4 – Season Vegetable Gardening

- Timing
- Temperature
- Light
- Know Your Vegetables

- Planning!

Timing

- Timing; use succession planting and intercropping for continuous planting and harvest
- Set up ‘infrastructure’ to prolong growing season, depending on the needs of the vegetable

Succession Planting

- Involves staggering your plantings to extend your harvest
- Works especially well for determinate, quick maturing vegetables

Succession Planting – Vegetable Selection & Timing

7 Days	10 Days	14 Days	21 Days	30 Days
Baby Greens	Lettuce (head)	Beets	Carrots	Summer Squash
Radishes	Kohlrabi	Arugula	Cucumbers	Swiss Chard
Spinach	Peas		Mustards	
	Sweet Corn		Melons	
	Beans (bush)			

Succession Planting

- Plant vegetable crop at earliest ‘planting window’, then continue at recommended interval through the remainder of the season as long as there’s adequate time left for the particular crop to mature
- Plan for adequate space in garden
- Season extension techniques can be used to get earlier start for planting & longer harvest

Succession Planting

- After harvest, immediately replant the space
- Intercropping can be used to further optimize production from a limited space

- Take care of your soil; replenish nutrients
- You'll be working hard & so will your soil!

Intercropping

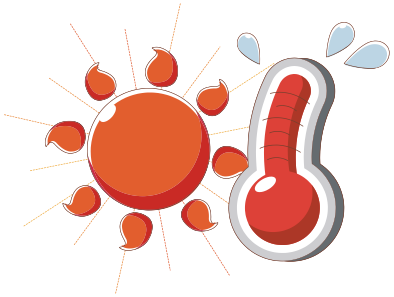
- Pair quick maturing vegetables with slow maturing
- Example: Plant carrots with beets

- Pair compatible companions
- Example: Cabbage with onions

Constraints - Temperature

- Many vegetables expire at cold temps; some suffer at high temps

- Plant vegetables for growth during their preferred temperature



- Warm Season vs. Cool Season Vegetables

Warm vs. Cool Season Crops

- Warm season crops:
  - Squash, tomatoes, eggplant, okra, cucumber, beans, chile, bell peppers
- Cool season crops:
  - Broccoli, carrots, spinach, lettuce, chard, peas, kale, onions, beets, radishes

Temperature

- In general, warm season vegetables prefer temperatures in the 75 – 85 F range; cool season vegetables prefer temperatures in the 65 – 75 F range

Temperature

- Warm season vegetables will be injured or killed by frost
- Cool season vegetable tolerate (or are improved) by frost, but growth slows at very low temperatures

Light

- Vegetables grown for their ‘fruit’ (tomatoes, peppers, melons, squash) require at least 8 hours of sunlight per day for healthy growth
- Limited sunlight during winter months slow or prevent fruit set

- Leafy greens require approx. 6 hours

4 – Season Vegetable Gardening

KNOW YOUR VEGETABLES

Selecting the Vegetable and Cultivar

- Know your vegetables
- Determinate vs. indeterminate
- Days to maturity
- Tomatoes
  -‘Early Girl’ 52 days
  -‘Better Boy’ 75 days
  -‘Zapotec’ 80 days

Know Your Plants

- Determinate: Bush-type. Tend to set fruit at same time and exhibit earlier maturity
- Indeterminate: Vining, pole-type. Tend to set fruit over prolonged period and have higher overall yields

Additional Thoughts on Cultivar Selection…

- Different cultivars of the same type of vegetable exhibit different tolerance to cold (and hot) temperatures
- Look for guidance in seed catalogs, from fellow gardeners, as well as your own experience

Plant Your Garden

- Direct seeding is the easiest way to plant your garden

- Transplants can be used to obtain earlier maturity

Transplants

- Investment in a light table and bottom heating pads will greatly contribute to 4 – season vegetable gardening success

http://www.gardeners.com

http://www.growerssupply.com/farm/supplies

Transplants

- Start 4 - 8 weeks before planting outside
- Plant seed in clean potting soil or peat pots
- Place transplants under grow light, preferably with bottom heat

HARDEN off your seedlings

- About one week before transplanting:
  - Put your seedlings in a shady place outside for a 2-4 hours, then bring them back inside
  - Each day increase the time
  - Slowly begin dividing the time between the shade and the sun
  - After 1 - 2 weeks of adjustment the seedlings should be ready for the garden plot

Warm Season Vegetables - Very Tender

- Cucumber
- Melons
- Pumpkins
- Squash
- Sweet potatoes
- Okra
- Eggplant
- Chile
- Bell pepper

Very Tender Vegetables

- Use transplants (even cucurbits…just be very careful not to disturb root ball)
- Plant on south side of ‘hills’
- Use black plastic mulch, or other material to warm the soil

Warm Season Vegetables - Tender

- Sweet corn
- Snap beans
- Tomatoes
- Black-eyed peas

Tomatoes

- Warm season, tender vegetable
- Start transplants approx. 8 weeks before planting outside for earlier harvest
- Plant outside early using wall-of-water or other warming technique

Tomato Cultivars – Cold Tolerant

- Parthenocarpic; fruit are produced even when temperatures are too cold for pollination
- ‘Oregon Spring’
- ‘Oregon Star’
- ‘Legend’
- ‘Siletz’
- ‘Saucey’
- ‘Gold Nugget’

Grafted Tomatoes

- Grafted tomatoes are created when the top of one (scion) is attached to the root (rootstock) of another
- Scion is a variety that produces high quality fruit
- Rootstock is a variety that may:
  -take up water and/or nutrients more efficiently
  -be resistant to diseases or pests
  -be tolerant of salinity and/or water stress
  -*provide resistance to temperature extremes*

Beans

- Most are warm season, herbaceous annuals (exceptions: Garden Pea and Broad Beans that are tolerant to frost or light freeze)

Bean Culture

- Low humidity and high temperatures cause blossom drop
- Bush = Determinate
  Pole, Vining = Indeterminate
- Use bush beans for a quick crop; quick maturity (50-60 days) compared to pole beans

Cool Season Vegetables - Half Hardy

- Beets
- Carrots
- Parsnips
- Endive
- Lettuce
- Cauliflower
- Swiss chard
- Potatoes
- Celery

Carrots

(Daucus carota var. *sativus)*

- Half-hardy vegetable

Carrot Culture

- Best growth between 59 to 65°F
- Temperatures below 50°F decrease color development and growth
- Prolonged high temperatures cause strong flavor and coarse roots

Carrots (*Daucus carota* var. *sativus*)

- Somewhat tolerant to frost
- Mulch heavily before freeze
- Harvest throughout the winter months

http://trends.move.com/wp-content/uploads/2008/01/carrots.jpg

Cool Season Vegetables - Hardy

- Broccoli
- Brussels sprouts
- Cabbage
- Turnips
- Kale
- Kohlrabi
- Mustard
- Radishes
- Chinese cabbage
- Spinach
- Onions

Cabbage (*Brassica oleracea* var. *capitata, tuba, & sabauda)*

- Hardy vegetable crop
- Closely related to broccoli and other Brassica crops
- Comes in shade of green to purple; smooth vs. crinkled leaves
  -Ornamental varieties

Cabbage Culture

- Start transplants inside approx. 6 weeks before planting outside for early maturity
- Best quality when planted in midsummer for fall maturity

After harvesting, leaves make good green manure

http://faculty.ucc.edu/biology-ombrello/images/cabbage%20purple.jpg

http://bexartx.tamu.edu/HomeHort/F1Column/2007%20Articles/Plant%20of%20the%20Week/Cheers%20Cabbage.jpg

Cool Season Vegetables - Very Hardy

- Tatsoi (Rhymes with ‘big boy’)
- Claytonia

Tatsoi (*Brassica narinosa*)

- Spinach mustard, Spoon mustard, Rosette Bok Choy
- Withstands temps down to 15°F
- Overwinters in very cold areas with row cover or other minimal protection
- Harvest in 45 – 50 days

http://www.stonofarmmarket.com/tat-soi.html

Claytonia (*Claytonia perfoliata*)

- Miner's lettuce, Winter purslane, Indian lettuce
- Very cold tolerant
- Native to North America
- Used as leafy green vegetable by miners in the California gold rush
- 40 days to harvest; multiple cuts can be made

http://en.wikipedia.org/wiki/Claytonia_perfoliata#mediaviewer/File:Salade_de_pourpier.JPG

4 – Season Vegetable Gardening

INFRASTRUCTURE

Basic Tools for Cold Weather Protection

- Microenvironments
- Mulch
- Cloches; i.e.. wall-of-water, plastic containers, milk cartons (with bottom cut out)
- Row Covers

More Advanced

- Cold frames
- Hoop houses
- Greenhouses

Microenvironments

- Spaces in your yard or garden that are protected from cold winds and weather
- Sheltered spots that create a buffer in temperature
  - Against a house
  - Between two buildings
  - Beside a wall
  - Between taller, larger plants

http://www.winnscape.com.au/original%20pictures/PROJECTS%20016.jpg

Mulch

- Types
  - Straw, leaves, wood chips, newspaper, plastic, pecan shells, compost
- How to apply
  - Once plants are established, cover ground 2 – 4 inches
  - Water to help settle
  - Don’t cover plants (will lead to etiolation)

Mulching

- Pros
  - Keeps weeds at bay
  - Conserves soil moisture
  - Increases soil temp
- Cons
  - Could harbor pests
  - Labor and cost investment
  - Increases soil temp

http://thailand.ipminfo.org/images/components/Organic_farm_egg_plant_mulching_3.JPG

Cloches

Burpee.com

http://www.naturemoms.com/blog/wp-content/uploads/2008/02/milk-jug-cloche.jpg

Cloches (rhymes with slosh)

- Materials that give small, tender plants protection from frost, wind, and rain
- Items such as wall-of-water, soda bottles, milk jugs, and food containers
- Remove or open when temperature rises
- These recyclable materials can be reused
- While getting a head start on your garden you are saving these items from the landfill*!*

http://justsopress.typepad.com/garden_klog/images/2008/05/08/080502_008.jpg

Row Covers

- Provides some protection against freezing temperatures (about 4-6^{o} F boost)
- Hoop supported vs. floating
- Perforated polyethylene vs. spun bonded polyester or polypropylene
- Water permeable
- Air permeable
- Remove or open when temperature rises

http://tinyfarmblog.com/wp-content/uploads/2008/06/spr08_row_cover_everywhere.jpg

http://www.gallupgrowers.com/blog/wp-content/dsc00334.jpg

Row Covers

- Don’t confuse with covers for insect exclusion

http://www.veggiegardeningtips.com/wp-content/uploads/2006/05/row-covers.jpg

Cold Frames

- Protects from early frosts
- Good place to start hardy seeds germinating
- Cool season vegetables will thrive within, even with freezing temperatures outside
- Safe place to start transplants being hardened off
- Easy to construct

http://lh3.ggpht.com/_kKnUhfzrGXo/RfI0iON42hI/AAAAAAAAAEU/3-h8Ta4sVDE/100_0863.JPG

Using Old Windows

http://i22.photobucket.com/albums/b333/1billp/Hotbed05030.jpg

http://greenbuildingelements.com/files/images/coldframe-c.png

Hoop Houses

Hoop Houses

- Meets the needs of small farmers and gardeners
- Low maintenance
- Relatively inexpensive to construct

Site Selection Hoop Houses

- Open, unshaded area
- Flat
- Well drained
- Close to water supply
- Close to electricity may also be desirable

Factors To Consider In Design

- Load limitation
  - Snow
  - Wind

- Light penetration
- Height of building
- Cost of construction
- Must be able to vent

Temperatures In Hoop Houses

- Winter Days
  - Temperature Can Reach 80° F
- Winter Night
  - Temperature 3-5° F Higher Than Outside

- Summer Days
  - Temperatures Can Reach 120° F or Higher
- Summer Nights
  - Same as Temperature Outside

Greenhouses

- Protected space for early and late season growing
- Sturdy and permanent against wind, snow, and rain
- Great for large garden transplant starts
- High cost and labor investment; high maintenance

http://www.igcusa.com/Hobby/bc/BC-capecod-large.jpg

4 – Season Vegetable Gardening

HOW DO WE PULL THE PARTS TOGETHER?

Ready, set, go!

- Put together your master plan
  - Plan and set up ‘infrastructure’
- Research vegetables
  - Sun vs. shade
  - Warm vs. cool
  - Days until maturity
  - Timing

http://i147.photobucket.com/albums/r290/honeyhillny/seed_packets.jpg

Designing your 4-Seasons Garden

- Set up a Gantt chart/calendar for your garden
- Plan for crop rotation
  -Example: Set up four sections

- What is your average last frost date? May 1

Planning Example

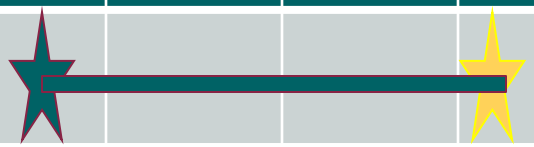
- ‘Oregon Spring’ tomato is a cold tolerant (parthenocarpic), determinate cultivar that matures in 75-80 days

Gantt Chart Example

Tomato	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Oregon Spring									

May 1 (last frost)
– count back 8 weeks (transplant start)
+ 3 weeks (wall-of-water protection)
+ 2 weeks (cold tolerant variety)

Gantt Chart Example

Tomato	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Oregon Spring									

‘Oregon Spring’ Tomato matures
in 75 to 80 days
(April may be too cold for harvest
of non-parthenocarpic tomatoes…)

Spring

- Harvest cool season vegetables
- Sow seeds of cool season vegetables/ use succession planting
- Some cool season vegetables work well as transplants: broccoli, cauliflower, cabbage, leeks – start earlier on your light table
- Row covers, cold frames, etc. can be used for earlier start and to speed growth

Spring

- Start transplants of warm season crops approx. 4-8 weeks before outside planting
- Use cold frames, hoop houses, wall of water or other temperature protection to give warm-season vegetables a head start outside

Summer

- Harvest warm season vegetables
- Succession planting and/or indeterminate cultivars proved for longer harvest period
- Some cool season crops can continue to be grown if sheltered by taller crops or with shading
- Mid to late summer, start cool season crops

Fall

- Continue harvest of warm season vegetables; extend harvest of some with row cover
- This is the best time to plant many cool season vegetables using seed or transplants

- Amend soil following warm season vegetable harvest

Winter

- Harvest cool season vegetables
- Use hoop house, row covers, mulch to provide some temperature protection for cool season vegetables
- Some hardy crops may persist without or with little added protection
- Late winter, start warm season transplants

US Hardiness Zone Map