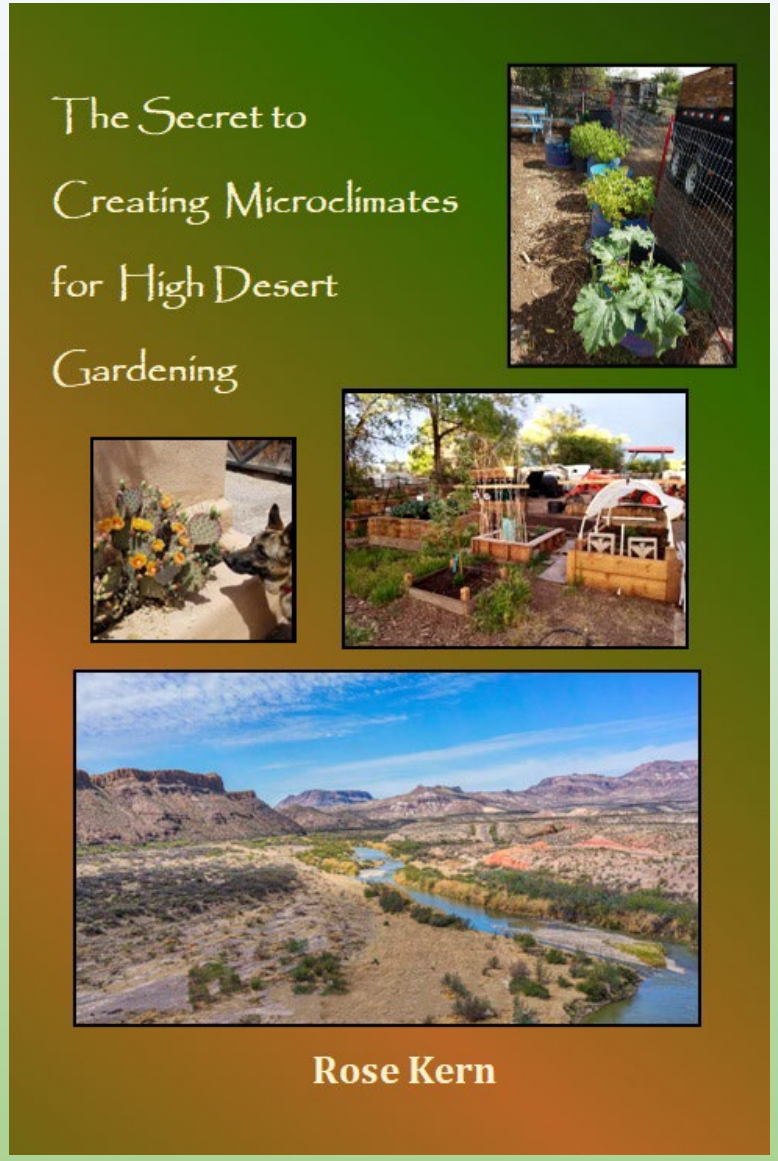


Protecting Plants in a Desert Climate

Created for the
USDA Extension
Master Gardeners

ALBUQUERQUE AREA EXTENSION MASTER GARDENERS

Presented by Rose Marie Kern

TODAY!
4/23/24

Climate

- The composite or generally prevailing weather conditions of a region measured throughout the year and averaged over a series of years.

- Temperature
- Air pressure
- Humidity
- Precipitation
- Sunshine
- Cloudiness
- Winds

What is a microclimate and why do we care?

Microclimates are locations within a larger geographic area that are warmer, colder, wetter or drier than the surrounding region.

- You can use natural or created microclimates to grow/protect many plants that would otherwise not thrive.
- You can find microclimates that are harboring pests that you don't want in your garden!
- You can provide microclimates to frogs, turtles, bees and other things you DO want in your garden.

Our Climate
Southwestern High Desert

- Dry with more pronounced temperature variations than Standard.

- How does this affect our area?

Sea Level vs High Desert

- **Standard Temperature lapse rate**
  - **2 degrees Centigrade per thousand feet**

• Location/Altitude	Temperature C/F
Sea Level	**34C/93F**
Red Bluff Reservoir (2,842 feet)	31C/87F
Roswell (3,671 feet)	29C/84F
Las Cruces (4,457 feet)	25C/77F
Albuquerque International (5,101 feet)	24C/75F
Santa Fe Airport (6,348 feet)	21C/70F
Ruidoso (6,813 feet)	20C/68F
Los Alamos Airport (7,171 feet)	18C/64F
Wheeler Peak (13,161 feet)	8C/46F

Standard versus New Mexico

Standard World Wide Sea Level

Average Diurnal Temperature Differences

(Day/Night)

13 to 15°F Daily

New Mexico Variation

Average Diurnal Temperature Differences

(Day/Night)

23 to 37° F Daily

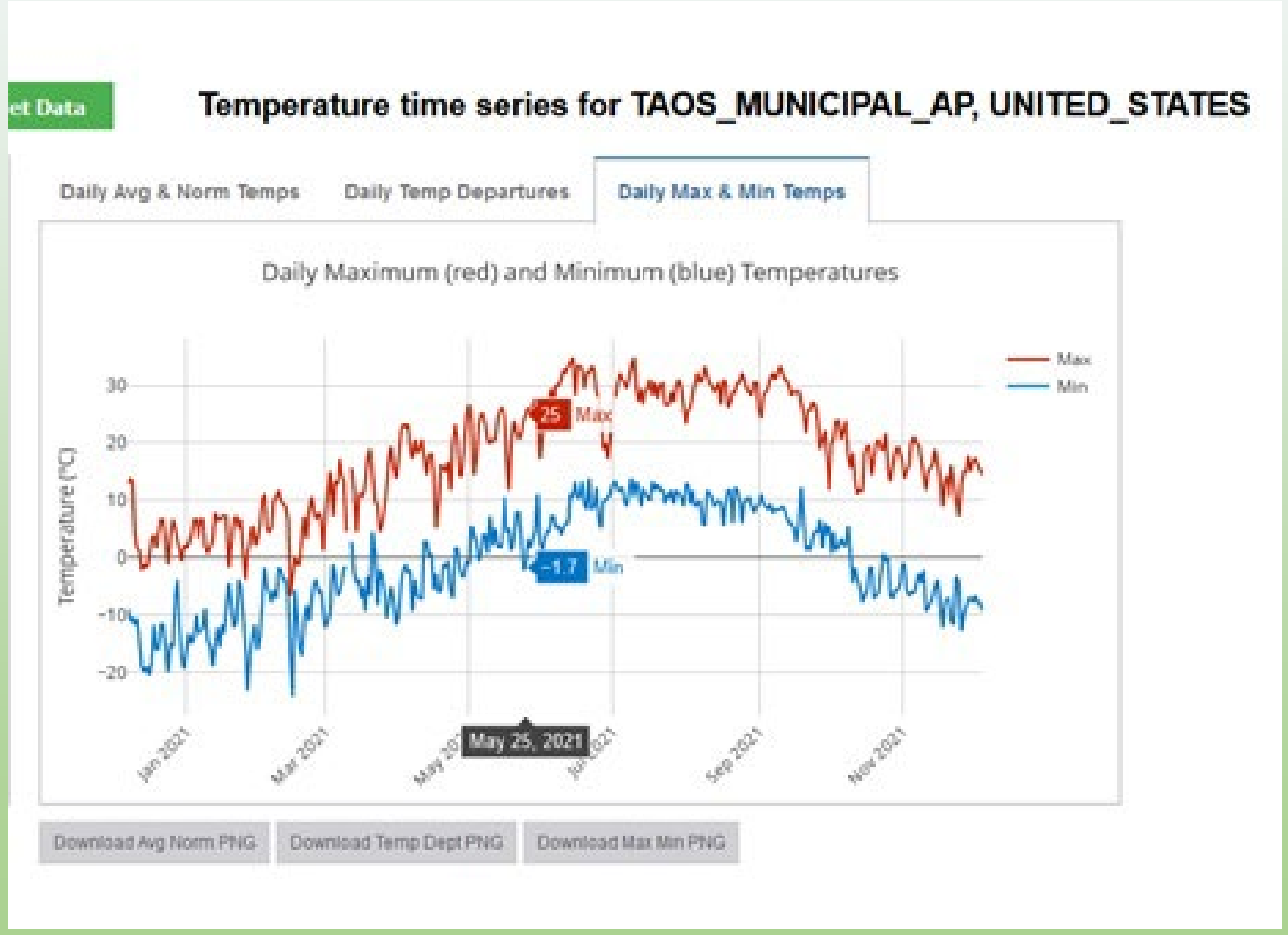
High °F	Low °F	Diff	Place
76	50	26	Alamogordo
65	38	27	Abiquiu Lake Dam
69	**46**	**23**	**Albuquerque**
77	48	29	Carlsbad
75	52	23	Carlsbad Caverns National Park
67	33	34	Chaco Canyon National Monument
68	40	28	Clayton
72	44	28	Clovis
64	28	36	Cuba
63	30	33	El Morro National Monument
63	27	36	El Vado Lake Dam
77	49	28	Elephant Butte Lake Dam
65	40	25	Farmington
66	31	35	Gallup
71	34	37	Gila Hot Springs
70	35	35	Grants
77	48	29	Hobbs
64	35	29	Las Vegas
65	32	33	Raton / Taos
76	46	30	Roswell
65	36	29	Ruidoso
65	**35**	**30**	**Santa Fe**
73	40	33	Socorro
73	44	29	Tucumcari
78	42	36	White Sands National Monument

Listing of places in New Mexico Showing the average Daily High and Low temperatures over a year's time.

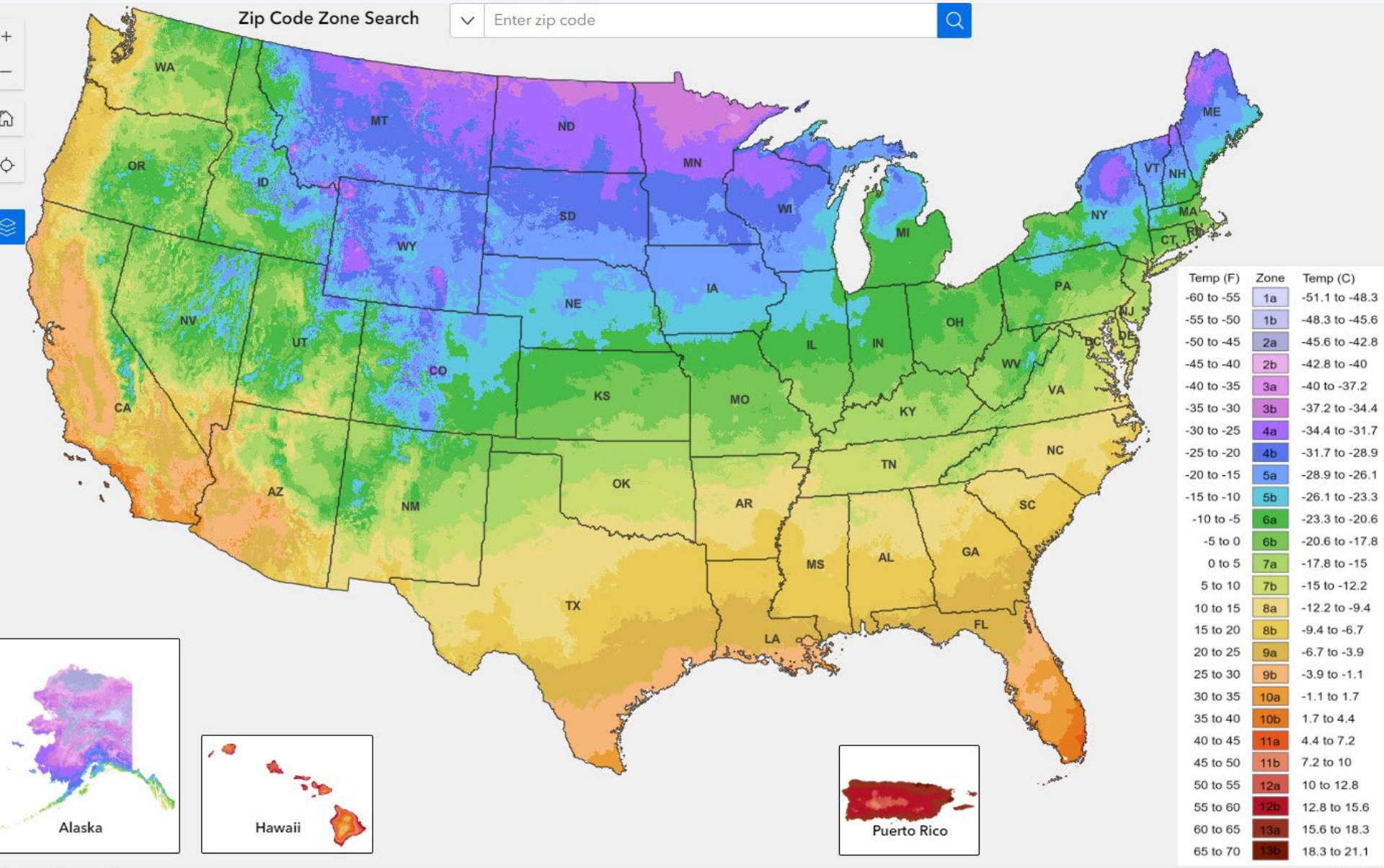
The average daily difference from high to low temperature in areas throughout the state.

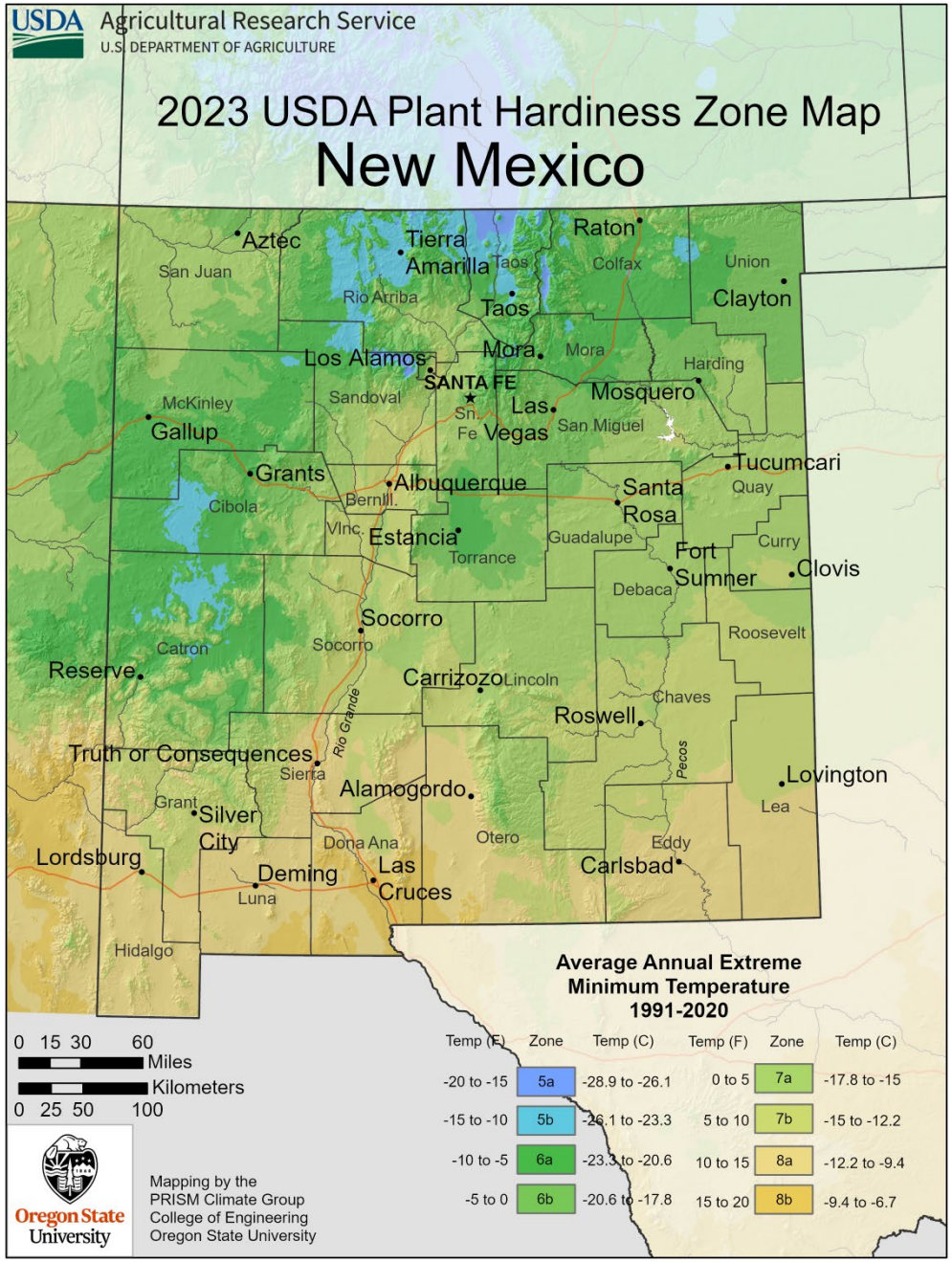
Average these together shows that as a whole New Mexico has **a 31.77 degree** variance in temperature daily.

Taos May 25, 2021 – High of 77°F Low of 29°F
48 degree difference in 24 hours



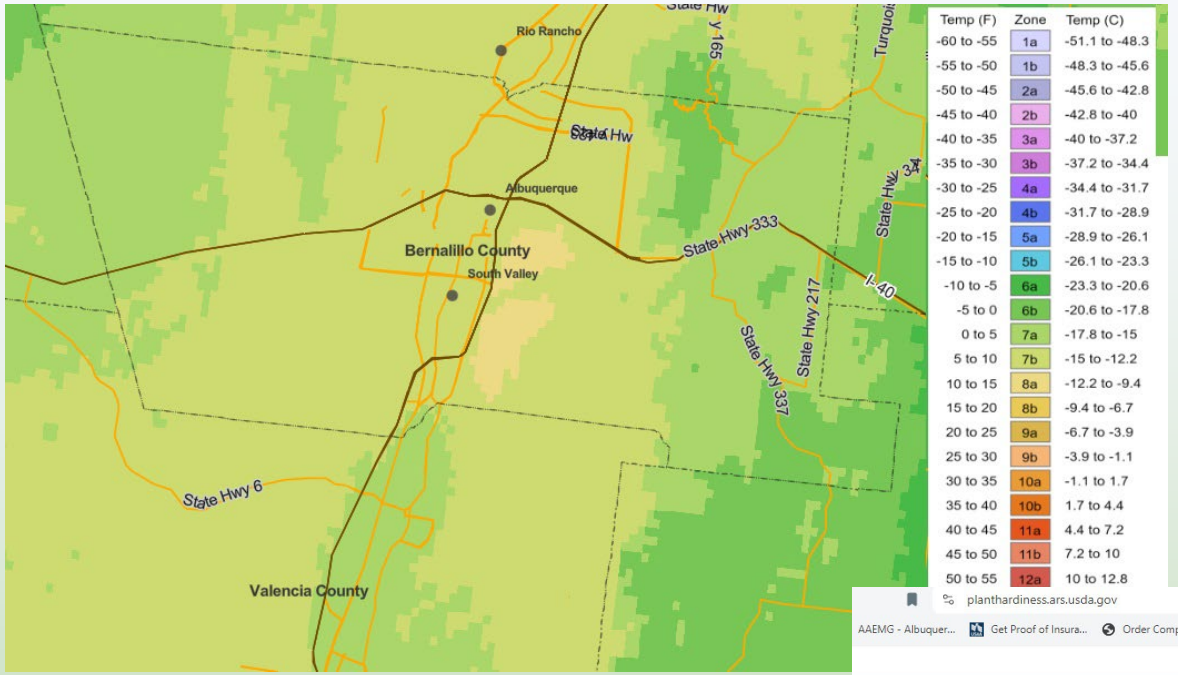
2023 USDA Climate Zone Map





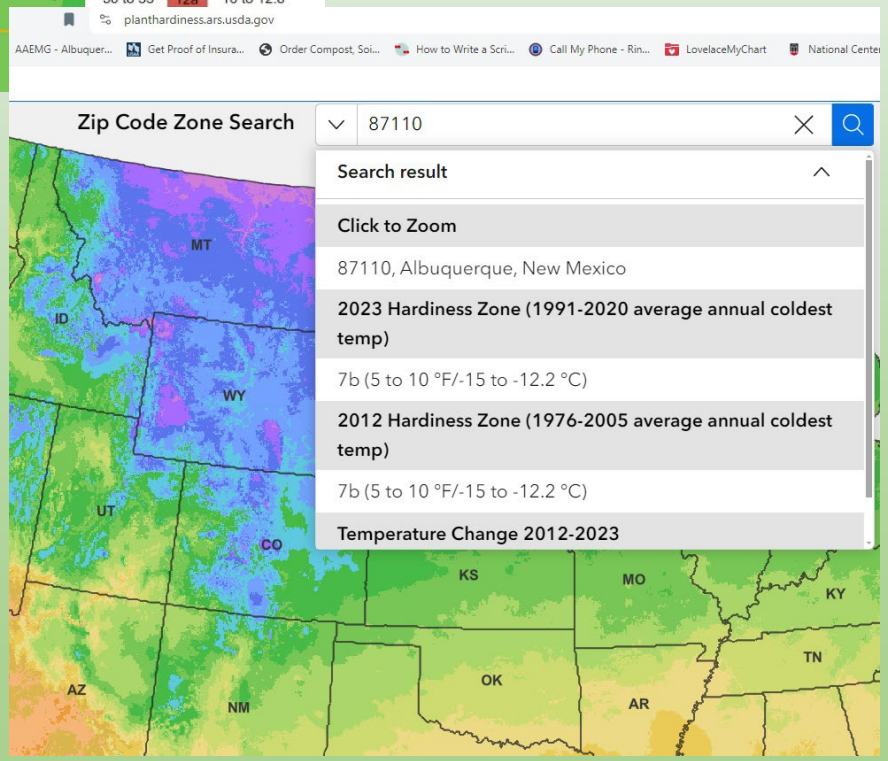
Temperature is the basis for most hardiness zone maps

In NM we have 8 climate zones ranging from zone 5a to zone 8b



Planthardiness.ars.usda.gov

Enter zip code for site specific information



Bernalillo County has six climate zones from 6a to 8a!

Forecast from Farmer's Almanac 2024

Nearest Climate Station	Altitude	Last Spring Frost	First Fall Frost	Growing Season
ALBUQUERQUE INTL AP, NM	5311'	Apr 12	Oct 29	199 days
ALBUQUERQUE VALLEY, NM	4954'	Apr 24	Oct 20	178 days
ALBUQUERQUE FOOTHILLS NE, NM	5994'	Apr 27	Oct 18	173 days
RIO RANCHO #2, NM	5288'	Apr 15	Oct 28	195 days
CORRALES, NM	5026'	May 1	Oct 12	163 days
MORIARTY 1 NE, NM	6220'	May 21	Sep 29	130 days

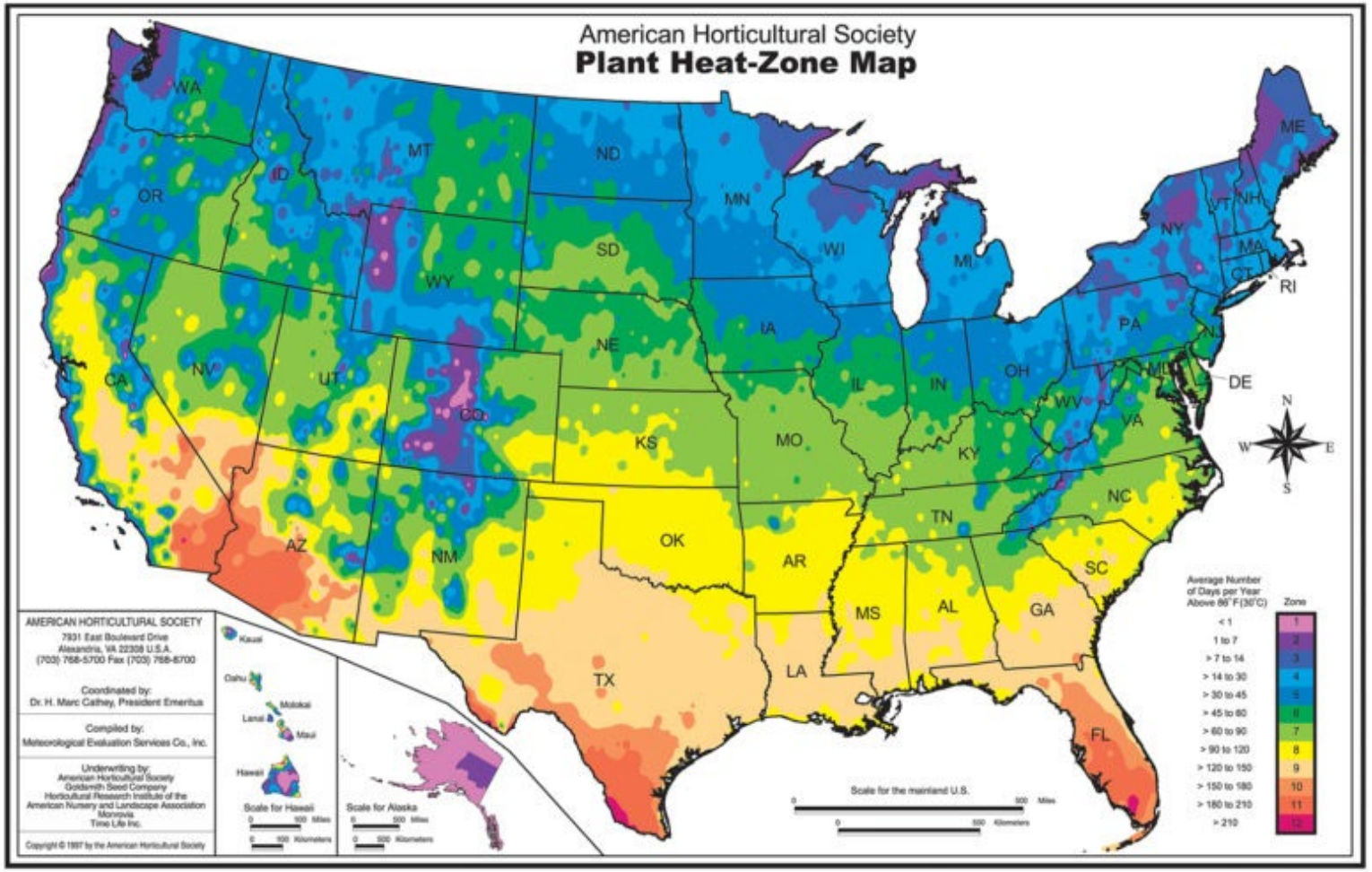
https://www.almanac.com/gardening/frostdates/NM/Albuquerque

A **frost date** is the average date of the last light freeze in spring or the first light freeze in fall.
The classification of freeze temperatures is based on their effect on plants:

- **Light freeze:** 29° to 32°F (-1.7° to 0°C)—tender plants are killed.
- **Moderate freeze:** 25° to 28° F (-3.9° to -2.2° C)—widely destructive to most vegetation.
- **Severe freeze:** 24° F (-4.4° C) and colder—heavy damage to most garden plants.

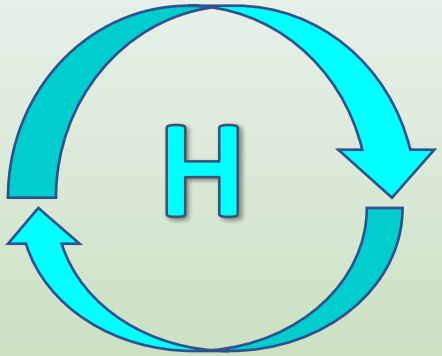
Heat zones map the number of days per year with a maximum temperature of 30 °C (86 °F) or higher. By the end of the century under the high emissions scenario, regions throughout the country will see significant increases in amount of hot days per year.

Bernco in general can expect between 90 and 120 days above 86 °F this year



High Pressure

- A heavy blob of air that looks like an upside down bowl – winds flow clockwise around the surface edge.



Large Dry High Pressure Systems

Equal Sunny Days!

- .

Low Pressure

- A lighter blob of air – bowl is upright and narrower more like a vase – winds flow counterclockwise around the surface edge .

The tighter the lines of pressure –
the stronger the windflow

Tijeras Canyon, I-40, Airport

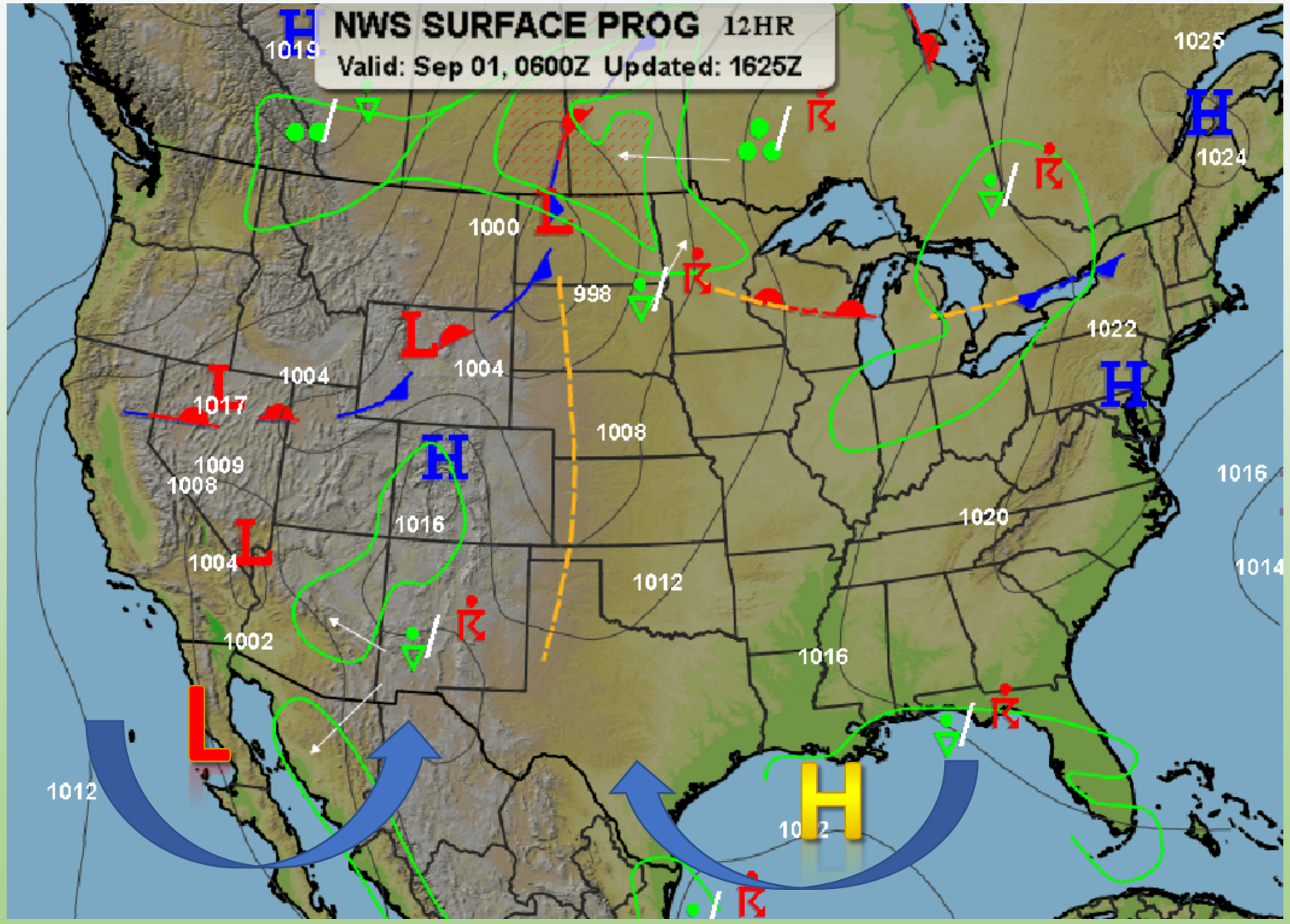
- Strongest winds pour through canyon when fronts slide down east side of state.

Most of the Wind across New Mexico comes from what direction?

WEST

- Prevailing Westerlies are the winds in the middle latitudes between 35 and 65 degrees latitude. Includes most of the U.S.
- These prevailing winds blow from the west to the east pulling moisture from the oceans inland.

Onset of Monsoon Pattern



- **Monsoonal flow patterns**. (July to September).
- Generally clear and calm in the morning, except valley areas that received rain the day before may have low dense fog until 9am

(Moisture lies ambient at mid-altitudes)

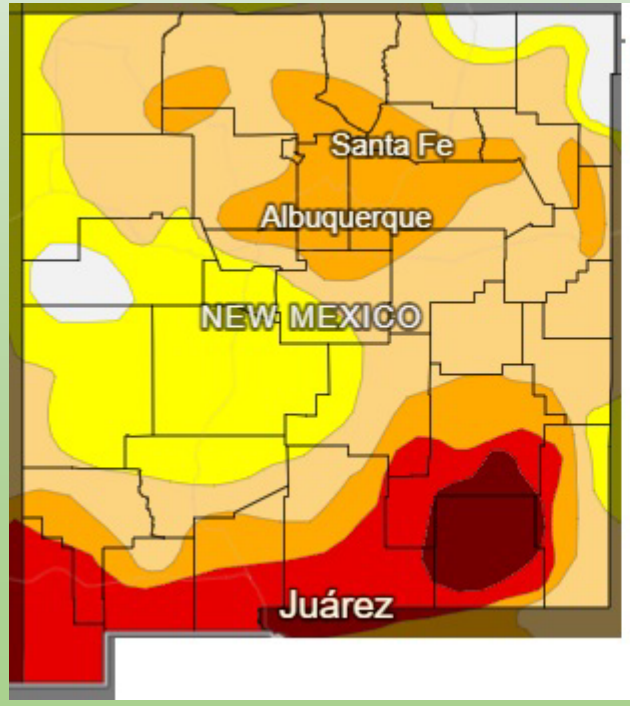
Scattered cumulus by noon growing upwards into storms by 2pm.

- Storms are **not organized**…they drift with the prevailing winds, peaking by about 7pm.
- After sunset cooler temperatures dissipate the storms, clear skies by midnight in most places.

Drought.gov

National Integrated Drought Information System

33	1.7 Million	53rd	44th
counties with USDA Drought Disaster Designations (primary)	New Mexico residents in areas of drought, according to the Drought Monitor	wettest March on record (since 1895)	wettest January—March on record (since 1895)
— 0 counties since last week	— 0.0% since last week	0.71 in. total precipitation ↓ 0.02 in. from normal	2.2 in. total precipitation ↑ 0.21 in. from normal



Legend

Drought & Dryness Categories	% of NM
D0 – Abnormally Dry	21.6%
D1 – Moderate Drought	39.2%
D2 – Severe Drought	19.4%
D3 – Extreme Drought	12.7%
D4 – Exceptional Drought	3.5%
Total Area in Drought (D1–D4)	74.9%

Average Precipitation across New Mexico

The table below gives yearly averages over the last decade for rainfall plus snowfall at cities, towns and parks in New Mexico.

Days	Place	Inches
79	Abiquiu Lake Dam	**10.3**
55	Alamogordo	**11.7**
61	Albuquerque	**9.5**
46	Carlsbad	**13.4**
55	Carlsbad Caverns	**15.7**
59	Chaco Canyon	**9.6**
68	Clayton	**15.8**
65	Clovis	**19.1**
61	Conchas Lake Dam	**16.1**
55	Cuba	**12.9**
102	Eagle Nest	**17.3**
83	El Morro	**15.1**
87	El Vado Lake Dam	**15**
51	Elephant Butte Lake Dam	**10.6**

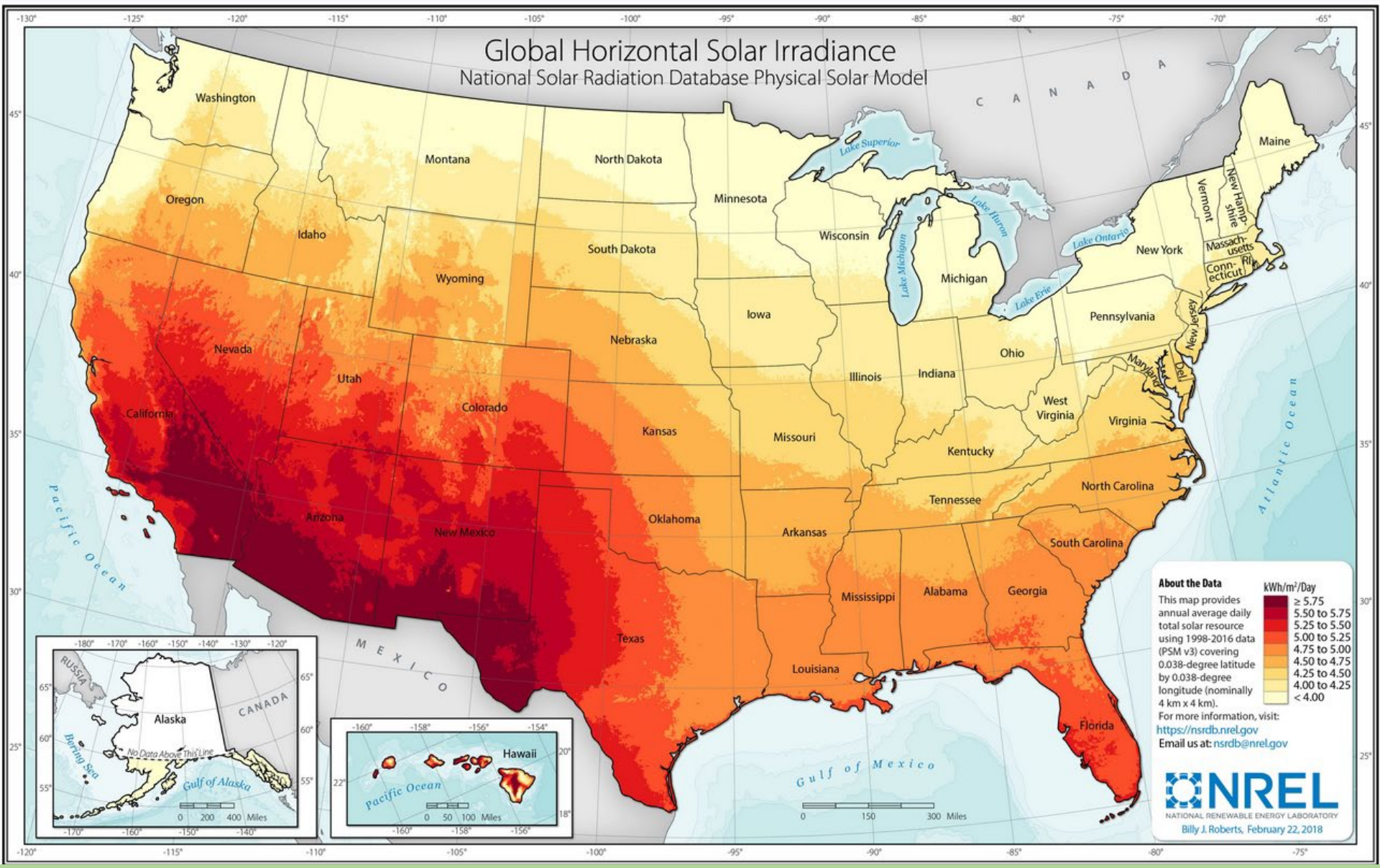
Days	Place	Inches
62	Farmington	**8.6**
76	Gallup	**11.6**
75	Gila Hot Springs	**16.3**
57	Grants	**10.5**
40	Hobbs	**17.9**
80	Las Vegas	**18.1**
82	Raton	**16.5**
55	Roswell	**12.9**
86	Ruidoso	**21.8**
66	Santa Fe	**14.2**
54	Socorro	**10.3**
69	Taos	**12.8**
65	Tucumcari	**17.1**
48	White Sands	**10.8**

https://www.currentresults.com/Weather/New-Mexico/average-yearly-precipitation.php

Average Precipitation (Rain/Snow)

Bernalillo County Locations

• Placitas/Sandia Park	8 to 12 inches
• West Mesa	8 to 10 inches
• ABQ Heights/UNM	10 to 12 inches
• South Valley/Isleta	10 to 11 inches
• Corrales/North Valley	11 to 12 inches
• Foothills	13 to 16 inches
• Tijeras/East Mtns	19 to 23 inches



New Mexico has the 3rd highest rate of solar radiation in the U.S.

Possibility of Sunshine	
January	88%
February	77%
March	73%
April	79%
May	76%
June	85%
July	75%
August	67%
September	71%
October	69%
November	87%
December	86%

New Mexico in general experiences only 5 to 8 TOTALLY overcast days per year.

Pimento plants.

Same soil conditions, moisture levels, pressure, and temperatures. Only difference is solar exposure.

Sun Scalding

Summary of New Mexico Conditions

- Below Average Rainfall (Average 9.4 in./year)
- Below Average Snowfall (10 inches/year
- Higher than average Diurnal temperature changes
- Lower Atmospheric Pressure due to elevation
- Less atmosphere protection
- More stars seen with naked eye
- Less Oxygen/Nitrogen (about 20%)
- More Solar Radiation strikes earth's surface

Microclimate

- The climate of a small area, as of confined spaces such as caves or houses, of plant communities, wooded areas, mountain valleys or of urban communities, which may be different from that in the general region.

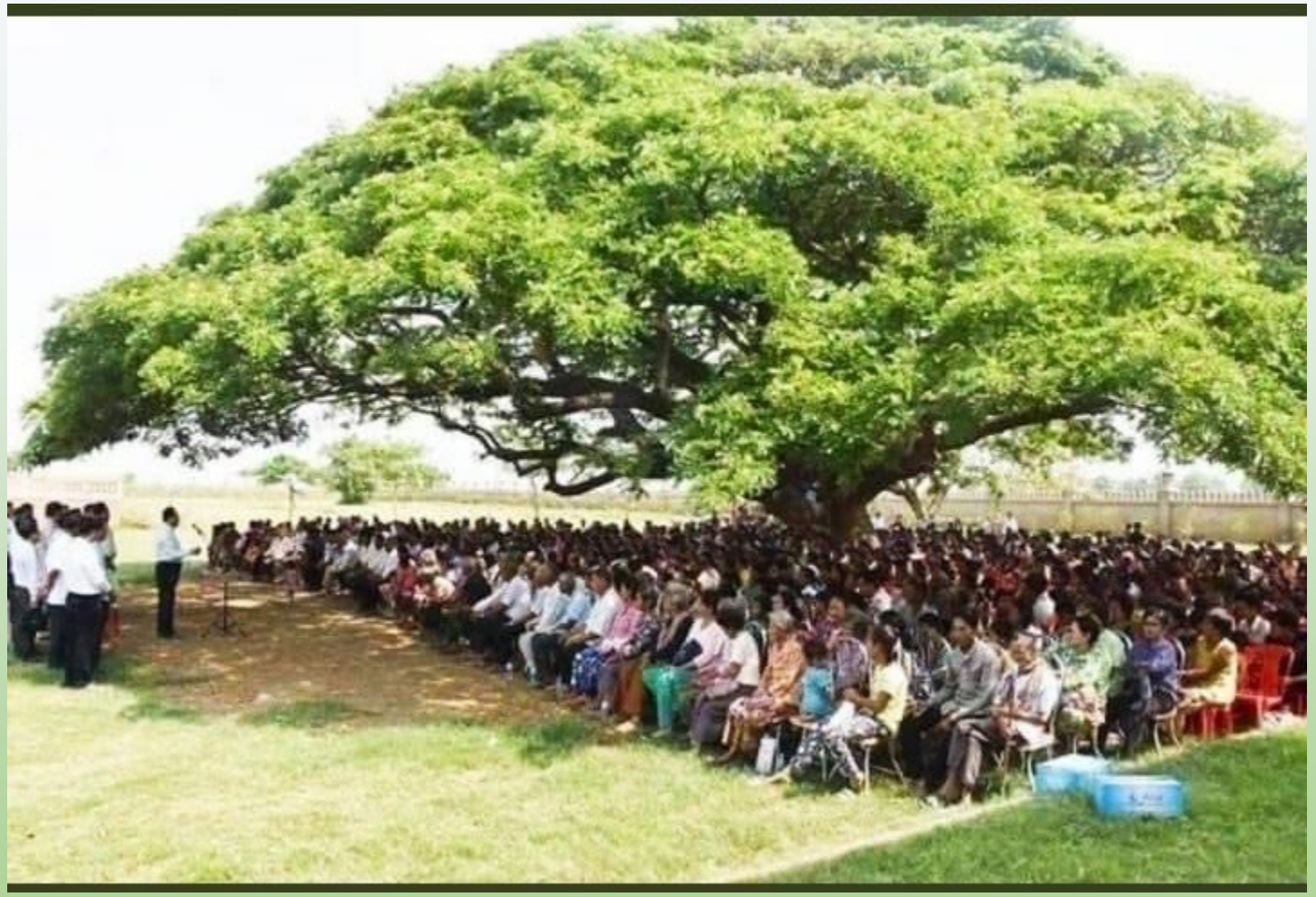
- Microclimates can be as large as a protected valley, or as small as a mini-greenhouse, protected courtyard or a well placed stone wall.

Natural Microclimates – Wind and Flat Surfaces

Flat surfaces allow winds to rip away moisture, create massive dust or sand storms, and pushing or tearing any plants it eventually reaches.

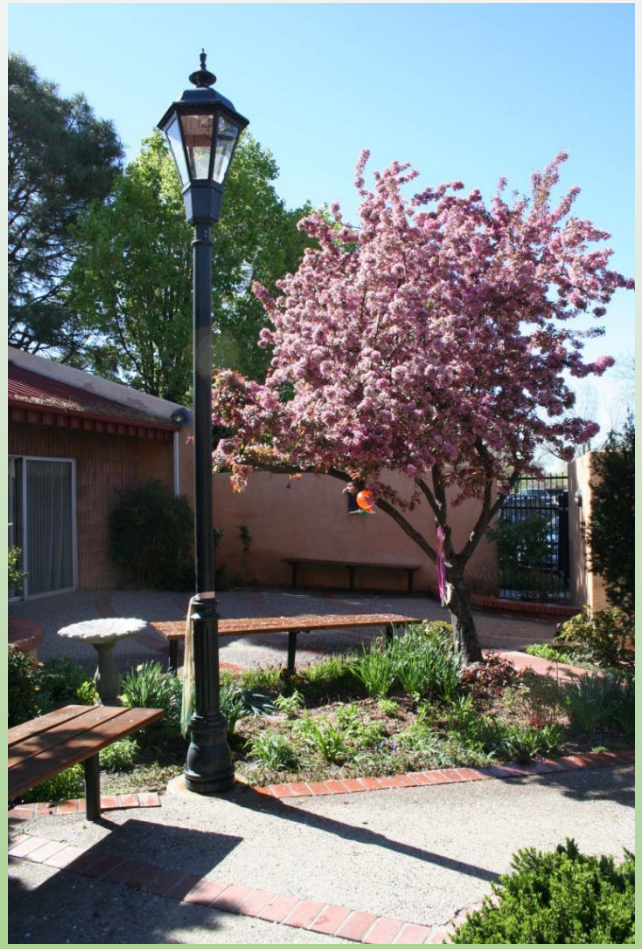
Dark Flat surfaces such as roads absorb and radiate heat, as much as 140 degrees Fahrenheit. Asphalt roads can become soft or deformed. Heat waves rising from hot ground often create a watery looking mirage

Natural Microclimates - Trees

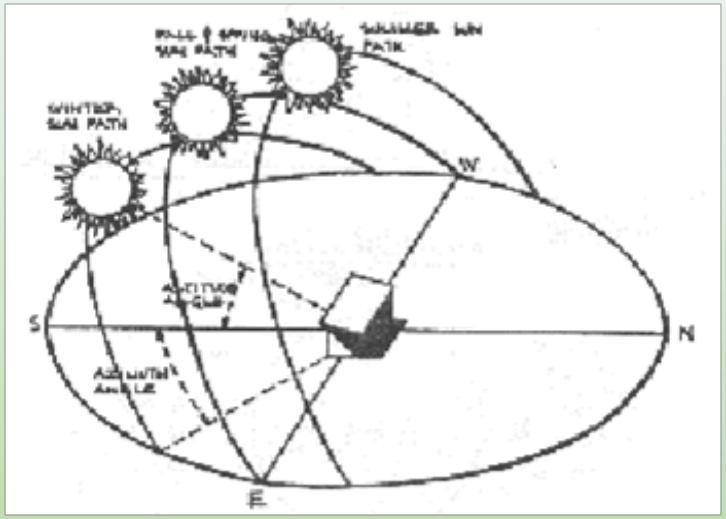


Microclimate Designs

Albuquerque Garden Center Courtyard

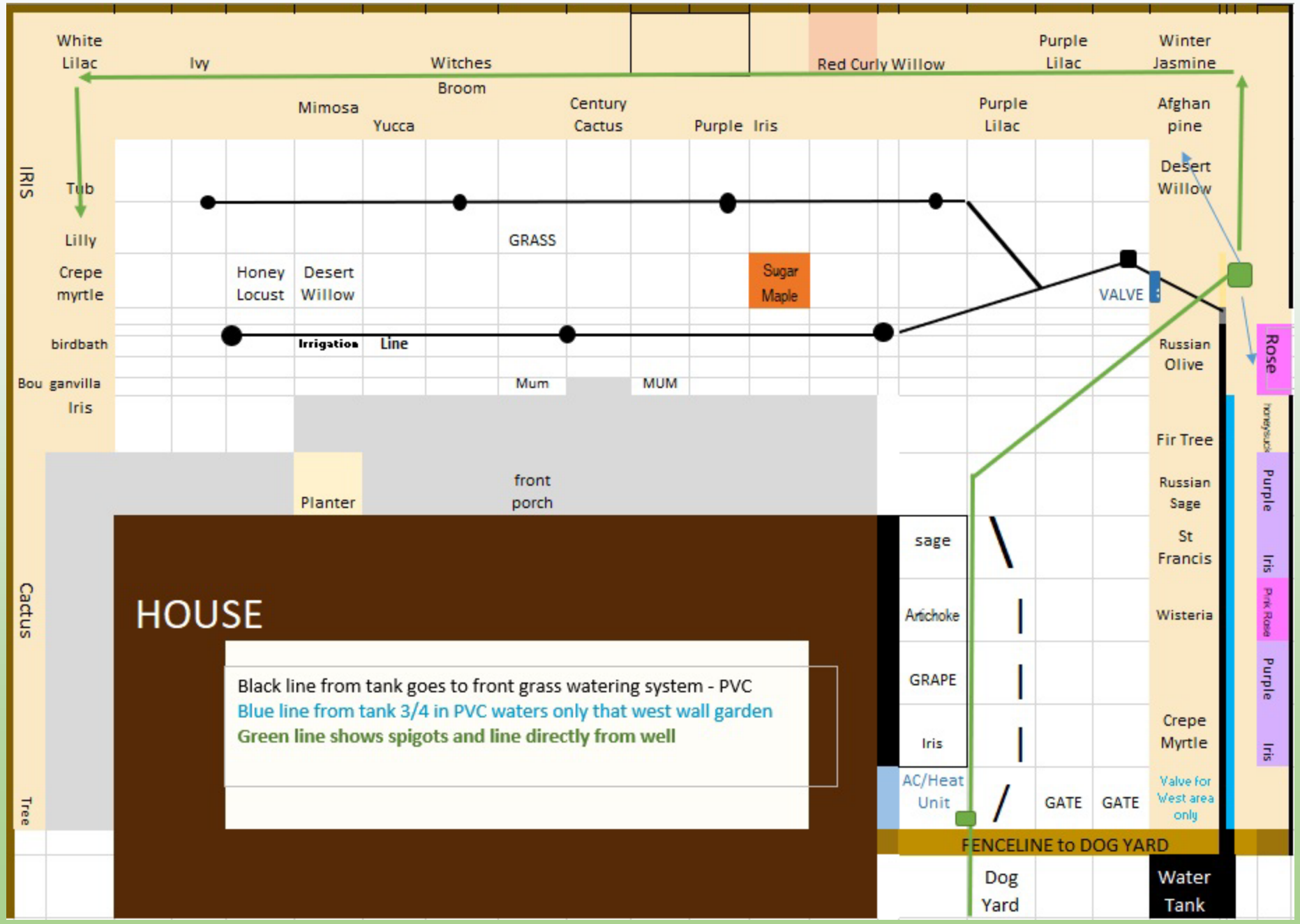


Planning your microclimates – Step 1
Know where the sun is!

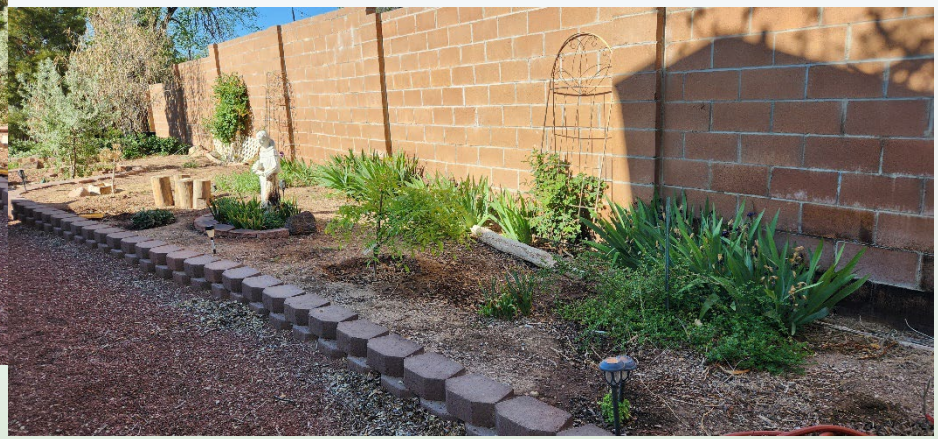


The Sun is lower to the south during the winter – and almost overhead during the summer.

Deciduous trees planted south of your home or garden will allow the warmth of the winter sun to keep plants warm, but block the strong solar radiation in the summer.

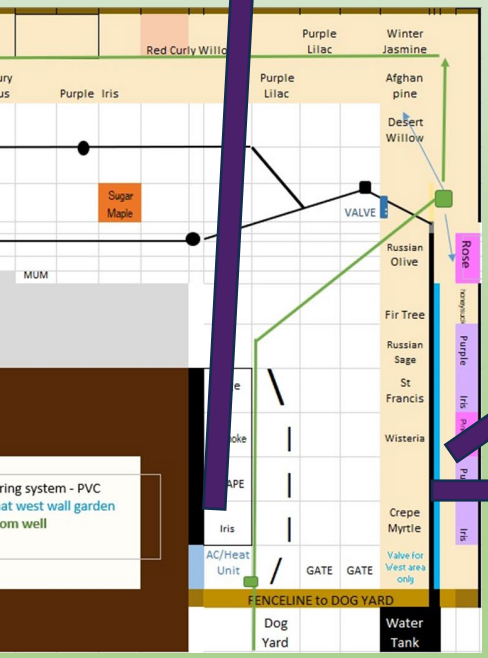

White Lilac
Ivy
Witches Broom
Red Curly Willow
Purple Lilac
Winter Jasmine
Mimosa
Yucca
Century Cactus
Purple Iris
Purple Lilac
Afghan pine
IRIS
Tub
Lilly
Desert Willow
GRASS
Crepe myrtle
Honey Locust
Desert Willow
Sugar Maple
VALVE
birdbath
Irrigation Line
Russian Olive
Rose
Bou ganvilla
Iris
Mum
MUM
Fir Tree
Planter
front porch
Russian Sage
St Francis
Cactus
HOUSE
sage
Artichoke
Wisteria
GRAPE
Iris
Crepe Myrtle
Tree
AC/Heat Unit
GATE
GATE
Valve for West area only
FENCELINE to DOG YARD
Dog Yard
Water Tank
Black line from tank goes to front grass watering system - PVC
Blue line from tank 3/4 in PVC waters only that west wall garden
Green line shows spigots and line directly from well

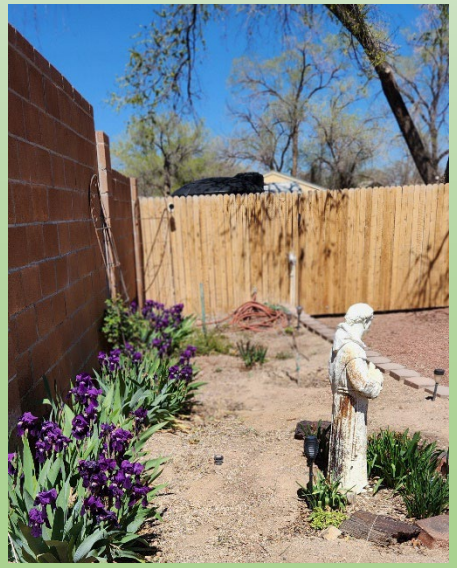
Observing Iris Blooms



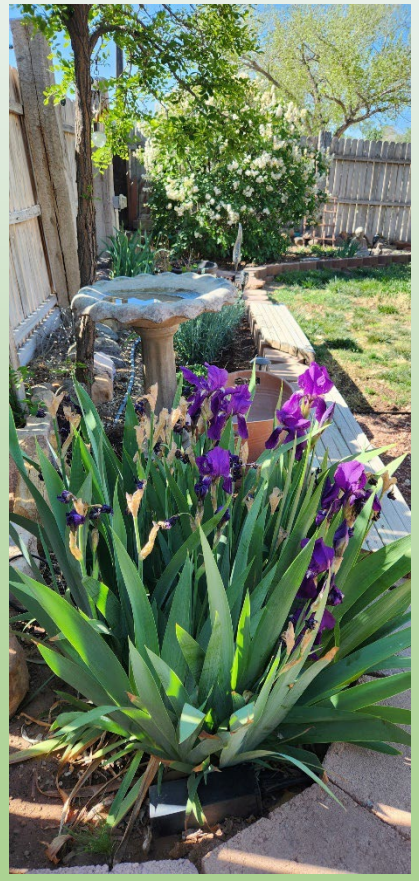
March 15 – West side of an adobe house wall protected on three sides

March 25 - East side of block wall, protected on three sides



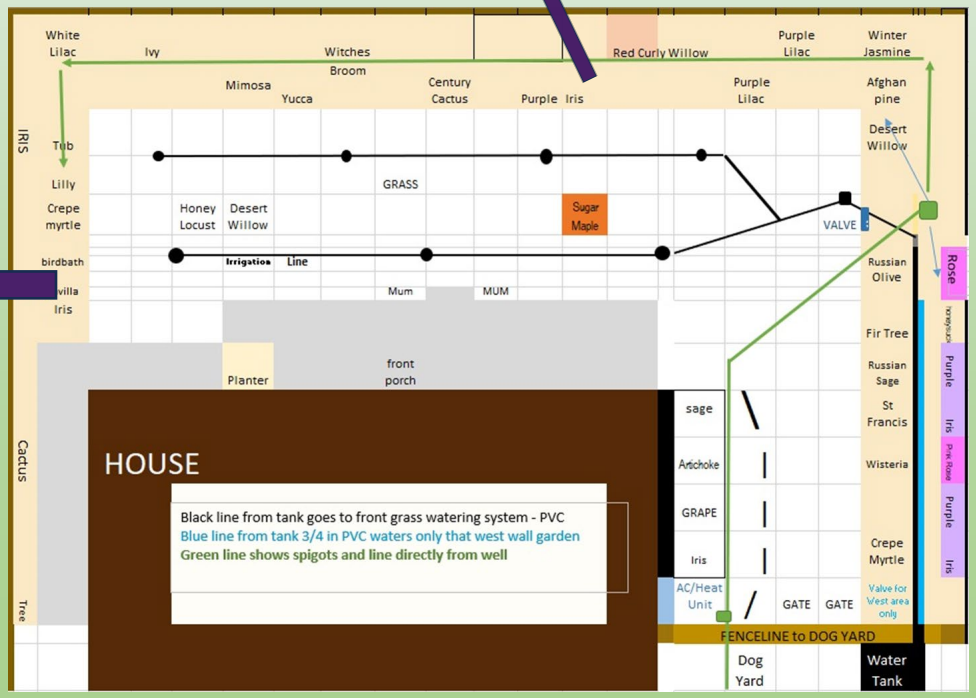


April 20 Wood slat fence northside keeps winter sun at bay.
Only gets sun early morning due to other vegetation.



April 11

Wood slat fence on east, open to yard on west side. Sun from 10am to 5pm

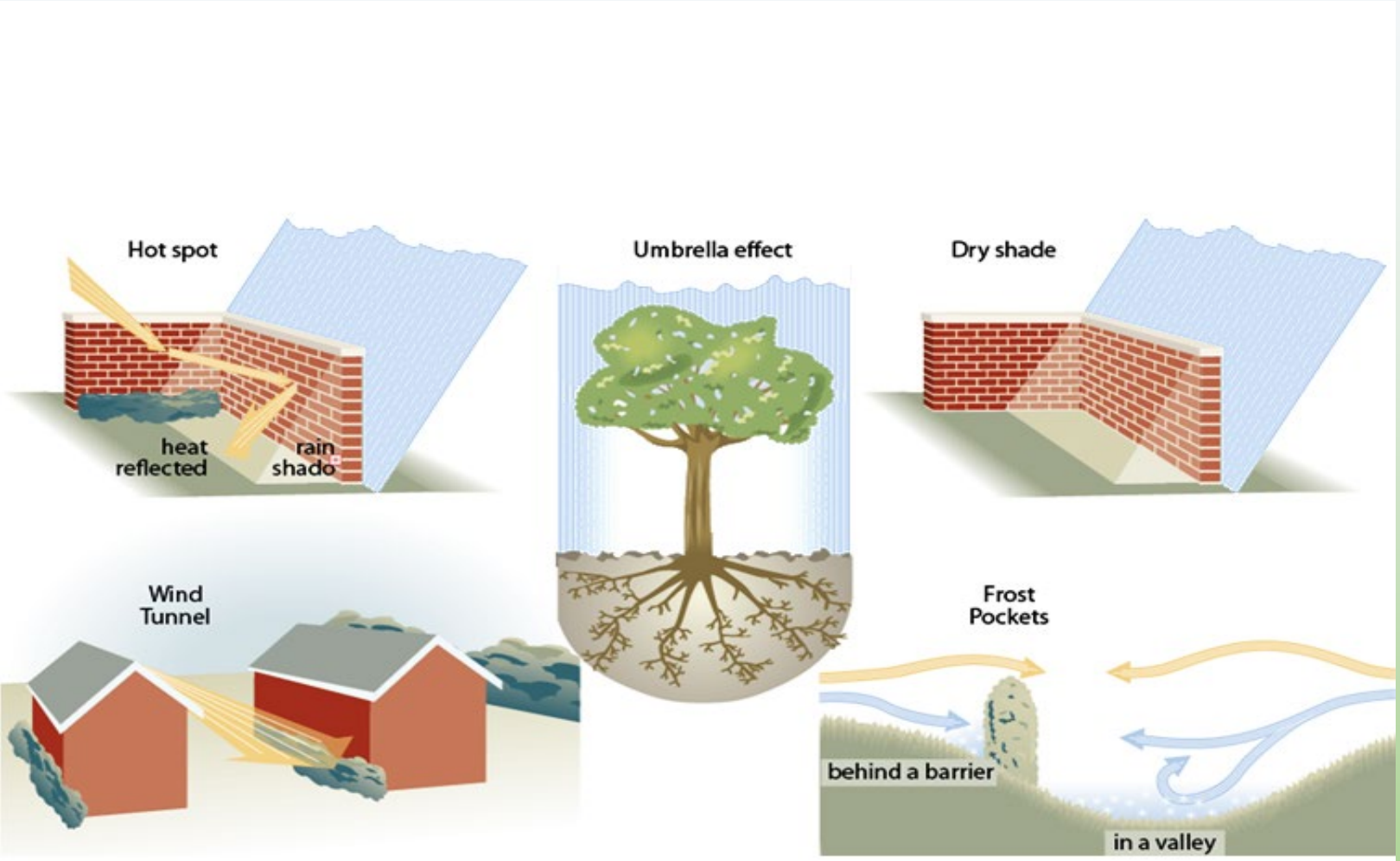


Coldest Micro Areas

- North side of fencing or buildings.
- Shaded areas
- North side of Hills

- Cold Air flows downhill. Walls and fences can capture pockets of cold air.
-

Microclimate Elements



Let’s look at some different strategies

Creating Beneficial Microclimates at Home

- Microclimates are created to protect plants from damaging winds, solar radiation, hail and extreme temperatures, and to offer them the best growing conditions possible.
- The first step in creating a beneficial microclimate is knowing the needs of the plant, the location of the sun and the general climate and soil conditions of your property.

Do Tomatoes need full sun?

- The packages of seeds, and the general wisdom imparted by many gardening books are written for places that are way up north and closer to sea level – they have 5,000 feet more atmosphere protecting from the sun!

Tomatoes and other crops can benefit during the summer by having some shade, especially during the afternoon heat.

Moveable Sheer curtains (left) and a trellis (above) provide a little afternoon relief from strong hot solar radiation.

This garden as several options for providing shade during the heat of the afternoon. Photo taken from southeast side.

Planted on the east side of a slanted vertical trellis these pea pods kept producing through the 105 degree temperatures in May/June of 2021.

A wire cage lined with heavy plastic served as last year's compost pile. This year soil was added to the top and it was planted with tomatoes, peppers, onions and Broccoli.

Trees located slightly northwest of the cage shaded it in the mid to late afternoon.

Options for providing shade

- Set the plants against the eastern side of a wall. The wall will shade them in the afternoon.

Walls and Fences also provide protection from strong winds

Shade with other Plants

- Plant on the North or East side of a large tree or other plants.

South facing wall stays warm in winter but the tree to the west ensures plants don’t fry.

Options for providing shade

Groups of plants will also protect each other. Plant rows of corn, or bushes to shade other plants.

Build a PVC pipe “box” and use glue guns or clips to attach shear curtains from Goodwill!

More Shade/WX Options

Build a PVC pipe “box” and uses clips to attach shear curtains

With camouflage netting on top, Cucumber vines on the southside of the box grew up and gave more shade to the green chili plants.

Location: Corrales
Window screening around a horse fence trellis keeps the bugs and heavy sun off the tomatoes.

More shade options

- Erect a trellis or canopy above the garden that only shades it for part of the day.

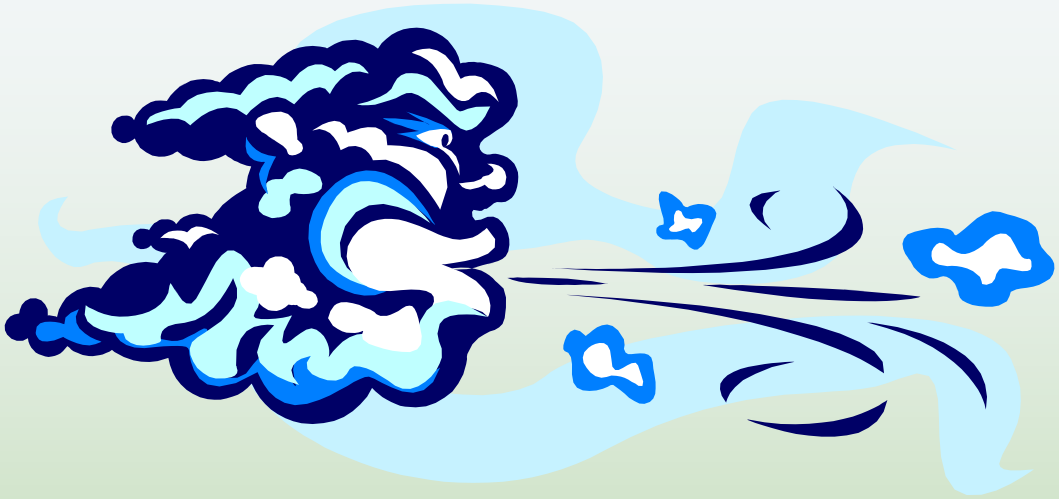
A porous sunshade lets in the rain, gives partial protection from Hail.

Green Chiles and onions

Above left: Planted in late April
Up right: Same box in early June
Left: LOTs of juicy green chilis

1 to 1 ½ inch PVC set in the ground. 8 foot stick of ½ inch PVC run through sewn end of curtain then set in ground. Curtain secured with clamps

Protecting from Wind



- Create wind barriers
  - Walls/Fences
  - Bushes
  - Row Covers
  - Big Rocks
  - Houses/Sheds
  - Wall o’waters

Wind Flow modifiers

- Trees and bushes slow it down
- Buildings and walls deflect it
- Lakes and Rivers load it with water
- Mountains re-route wind
- Valleys funnel it

Wind Blocks: cement blocks, bamboo poles, strawbales

Trellis, Wall and Fences all reduce windflow

Wind protections

Extra barrier on strong wind side.

Don’t fill the bed to the top with soil. Set the seedlings so the lip of the beds is forcing air up and over them. This one has an extra barrier screwed up on the west side which is where this garden gets its most devastating windflow.

Mass absorbs heat-Place heat loving plants against south facing walls to keep them protected from the depredations of winter cold!

Cover the plants at night to provide a dome of warmer air.

Use stone to absorb heat in cool areas to protect plants at night, or to shade plant roots.

Wall o’ Water or Kozy Coat

Used in spring to Protect young plants from cold, wind, and sun!

Protective Covers

- Milk jugs
- Plastic Pretzel Containers
- Blankets or sheets
- Trash Bags with clothespins
- Piles of Leaves or mulch
- Wall o'water

Fancy Cold Frame

Pipe canopy over a raised bed on hinges.

Not so Fancy Cold Frames

- Place a wooden box over a planting area – or build a raised bed.
- Put an old window over the top
- Be Careful not to overheat!

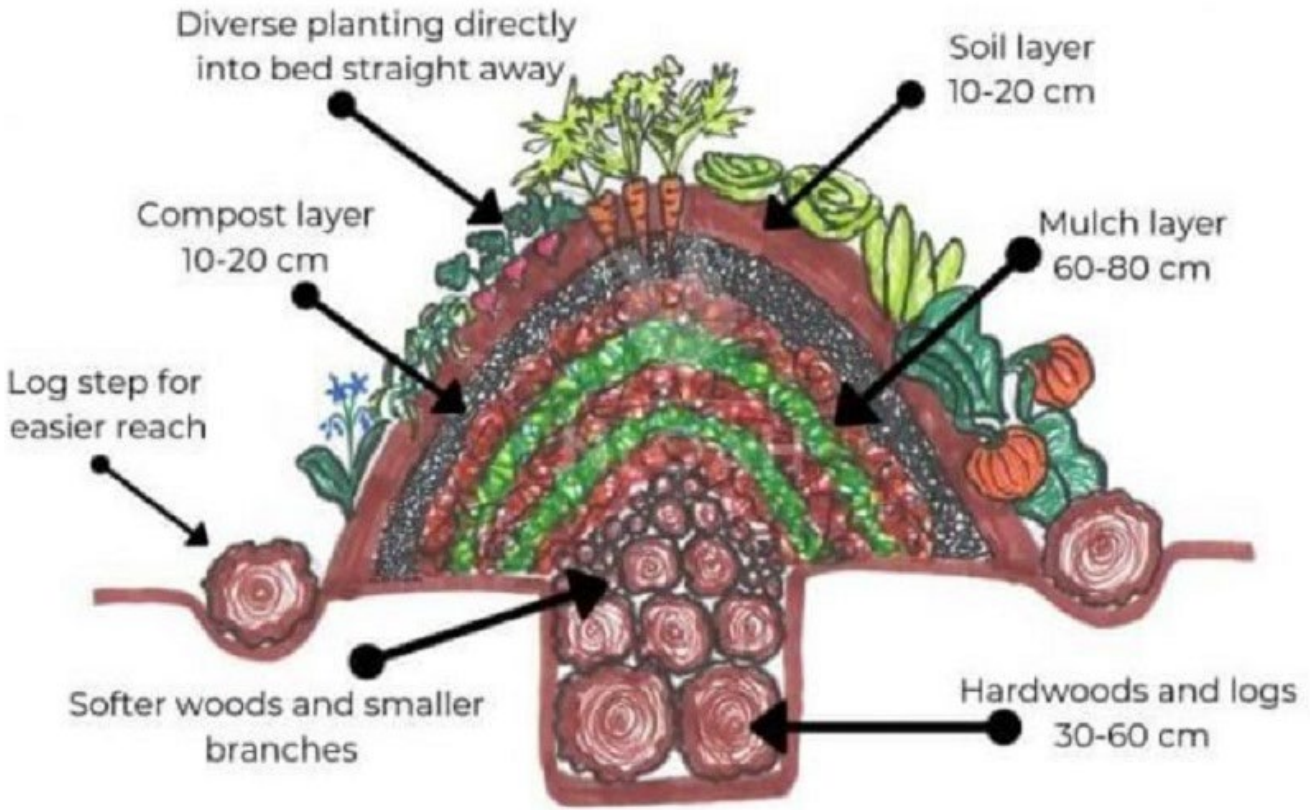
Covered raised beds

Examples of small enclosed yard microclimates.

A straw bale box placed to get partial shade can be used as a compose heap during the winter then topped with soil and planted early in the spring. The density of the bales holds moisture and heat.

Hugelkulture

Long rows of logs, branches and other bulky organic materials covered with soil. Plant directly into the mound.



Ongoing decomposition of interior materials adds heat.

Plant Fruit Trees Where?

On the NORTH side of the wall or house!

Keeping the roots colder as long as possible delays flowering – decreasing the chances that a late freeze will destroy the crop.

Plants can create their own microclimates

Kale, Parsley, Mums, bushy plants

- Leaves brown and die in cold weather, but if you leave them on the plant they protect the stem and root areas – which come back quickly as they warm in the spring.

- Prune them back to new growth after the last hard freeze.

The ultimate microclimate

Protects from

Cold
Hail
Wind
Snow
Critters


Tijeras, Elevation 7,321 Ft.

Less than $100

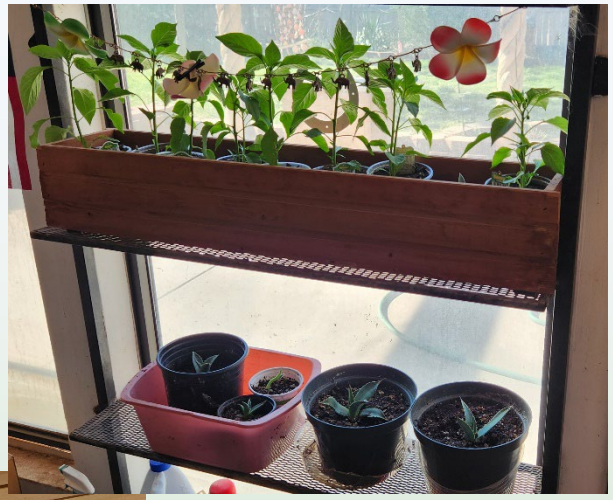
- 10x10 frame from an old shade structure
- 2 layers of thick plastic laid at 90 degrees over top
- Set against south wall of garage

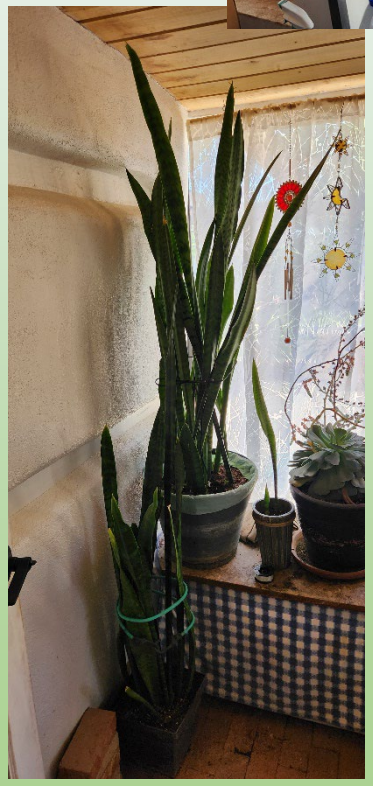
- Strawbales hold down the edges inside the tent
- Plastic milk jugs of water painted black absorb sunlight during the day and give off heat at night.
- Used to house seedlings of brassicas, onions, and garlic.

Greenhouse Heating Options

- Electric Space Heater or “Hot Rocks”
- Jar Candles or bunson burners
- Milk jugs painted black and filled with water
- Chemical hot packs
- Large Compost piles outside the North Wall

- Remember not to cook your plants!





Sunroom on south side of house lets in lots of sun in winter but not much in summer.

South facing windows and window boxes.

Think about this

- Cold air will pool in lower parts of the yard – or on the downhill side of a property against a wall.
- Black plastic or dark colored mulch will heat the earth earlier in the year
- Lighter mulch (rocks) will reflect heat away from the plant’s roots.

Cooling with Ground covers

Purslane

Pine Needles

Straw

Light Colored Gravel

Clover

Ground Warming strategies

Black 55 Gallon plastic barrels cut in half

Black Plastic over soaker hose.

Black or Dark Gravel

Assessing Your Yard

- Think about your property – what microclimates exist naturally?
- Where are the high points in the landscape around you?
- Where are the low points where cool air will pool naturally?
- Where does sunlight strike at different times of the day and/or year?
- How can you modify the area?

For More Information

Climate and Weather websites

https://garden.org/apps/calendar/?q=Albuquerque%2C+New+Mexico

www. Weatherunderground .com

www.aviationweather.gov

http://www.weather.com/outlook/homeandgarden/garden/weather/tenday/USNC0121

U.S. Weather Service Historical data www.weather.gov

https://weatherspark.com

US Climactic Data https://www.usclimatedata.com

Albuquerque City data www.visitalbuquerque.org/about-abq/weather

https://www.ufseeds.com/new-mexico-vegetable-planting-calendar.html

https://www.currentresults.com/Weather/New-Mexico/average-yearly-precipitation.php

Microclimate Websites

http://gardening.cornell.edu/weather/microcli.html

http://ucanr.org/sites/ucmgnapa/files/65702.pdf

Questions? - Contact Rose

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For More Information

The Secret to Creating Microclimates for High Desert Gardening

By Rose Kern

www.solarranch.com

Available on Amazon for $17.50
MG price today here only - $10/each.