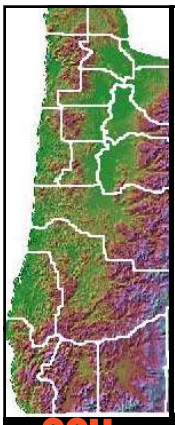


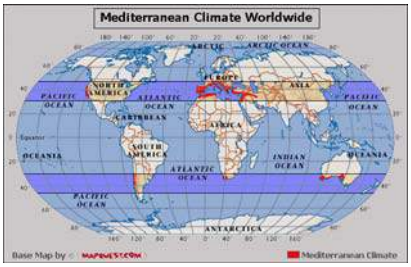
Climate and Weather of Douglas County

OSU Douglas County OSU Extension

Climate and Weather

- Climate is what we are suppose to get
- Weather is what we actually get
- Three climatic regions in Douglas County
  - Coastal (moderate summer and winter)
  - Valley (hottest summers and foggy winters)
  - Cascades (cool summer and once upon a time a cold snowy winter)

Mediterranean Climate



Mediterranean Plant Zones

Coastal Douglas County

- Winchester Bay to north of Reedsport
- Twenty mile stretch of the Oregon Dunes
- Average precipitation 80-100 inches
- Average summer temps, hi 60 low 50
- Average winter temps, hi 55 low 45
- Average growing season 250 days
- USDA zone 7-8

Valleys of Douglas County

- Follow the Umpqua River and main tributaries (Calapooya, Cow Creek, Deer Creek, Elk Creek, Little River, Myrtle Creek, Lookingglass Creek, Smith River)
- Average precipitation, 30-35 inches
- Average summer temps, hi 85 low 55
- Average winter temps, hi 45-50 low 25-40
- Average growing season 210 days
- USDA zone 7-8

Cascades of Douglas County

- Western Cascades have some valleys at 1,000 ft for forestry and grazing but most area over 3,000 ft elevation
- Average precipitation, 45-50 inches
- Average summer temps, hi 75-80 low 45-50
- Average winter temps, hi 40-45 low 20-30
- Average growing season 180 days
- USDA zone 6

USDA Hardiness Map

Climate Determines Plant Life

Coastal Climate of SW Oregon

- Climate comprises many factors
  - Temperature*
  - Humidity
  - Precipitation*
  - Wind
  - Solar radiation*
  - Fog
- Which is the most important for gardeners?

Which Factor is Most Critical?

- Temperature(gdu's or gdd's)
  - Influences plant growth (warm and cold)
  - Timing of phenological events
  - Fruit set
  - Fruit development
  - Seed set and ripening

Measuring Temperature

- The Umpqua Valley now has an AgriMet weather station at our HLC
- If you need your own weather instruments
- Keep weather records for daytime hi and low temps
- Track Et, rainfall, humidity
- Track phenological stages and record date
- Track sunlight in hours (1700)

Agri Met Weather Station

- https://www.usbr.gov/pn/agrimet/
- Go to: Station locations and links
- roso are the call letters for our site
- Can track Max-Min temps, precip daily or accumulated, GDD, soil temps, humidity, ET, wind direction and speed.

Growing Degree Days

- What is GDD?
  GDD= Daytime high + daytime low, divide by 2 -50F
- Example: 86+58=144/2=72-50=22 GDD
- 22 heat units accumulated for the day
- Track each day from Jan 1 during the year for insect pest development
- Roseburg 30 yr. average 2,780 for the growing season
- Temperature parameters 50 low, 86 high

Growing Degree Days

- Why track GDD?
- Forecast the rate of crop development
  - Grapes, tree fruit, berry crops
- Know when insects are at certain stages
  - Codling moth
  - Oriental fruit moth
  - Pear psylla
  - Peach twig borer

Growing Degree Days Comparison

- Roseburg 2800 gdd
- Eugene 2200 gdd
- Medford 3000 gdd
- Bakersfield 5600 gdd
- Fairbanks, AK 780 gdd

Websites to Gather Data

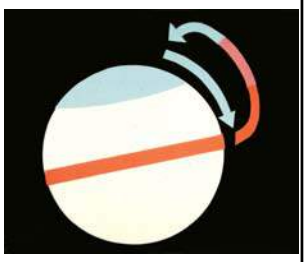
- **Farmers' Forecast**
- **http://www.weather.com/outdoors/agriculture/forecast/97470**
- Agricultural Forecast
- Almanac
- Growing Degree Days Calculator
- Seasonal Outlooks
- Maps
- News
- Give Feedback

Optimum Temperatures

- Cool season crops like 50-60 F mean temperatures. Lettuce, peas, carrots
- Warm season crops like 70-80 F mean temperatures. Tomatoes, corn, peppers, beans.

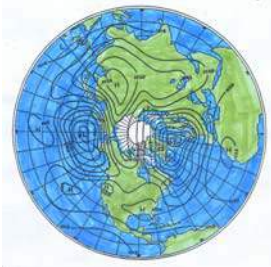
High and Low Pressure Areas

- WIND:
- Rising warm air at the equator creates a low pressure area
- Sinking cool air at the north and south poles create a high pressure area.



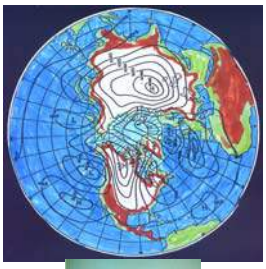
Marine Air Influence in Summer

Because solar radiation heats oceans and land masses differently, high-pressure zones in the northern hemisphere in summer, form almost entirely over the cool oceans, relative to the warmer land. This dry Arctic air when moved on shore produces dry summers on the Pacific Coast.



Marine Air Influence in Winter

Highs and lows are reversed in winter months. Warm marine air bulges northward over the relative warm oceans bringing winter rains. High pressure (cold Arctic air) forms over large land masses and bulge southward.



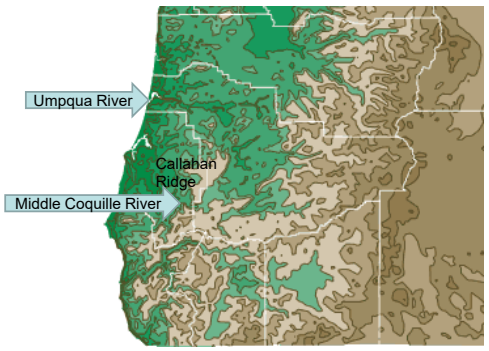
Temperature Driven by:

- 1. Proximity to the marine air flow
- 2. Elevation
- 3. Site specific factors

1. Proximity to Marine Air Flow

- The cool air and occasional fog that moves in most evenings can remain until mid morning
- In Douglas County those routes are along highway 38 and the Umpqua River, and highway 42 to the South Umpqua River and Coquille River.

Southwest Oregon Marine Air Flow



Marine Air Influence on Min and Max Temperature

- Is greatest where the proximity to marine air influence is closest
- Areas further from the marine air influence warm sooner in am and cool later in pm
- Callahan Ridge (1600 ft) blocks some marine air, making middle and south Umpqua warmer than north

2. Elevation

- Elevation determines the degree of the marine influence
- Higher elevation sites generally have lower daytime highs, and higher night time lows (fewer temps over 95)
- Douglas County has elevations to 9,182 ft (5 degrees cooler/1000 ft)
- Low elevation sites (valley's) will usually accumulate heat units fastest

3. Garden Site Specific Factors

- Slope (steepness)
- Aspect (direction)
- Tree shade
- Local topography
- Air drainage
- Soil types (match soil and rootstocks)

Humidity and Gardening

- 75-100% in winter
- 30-40% in summer
- What are specific impacts of these seasonal trends?

Precipitation Patterns and Gardening

- Rainfall distribution by month
- October 8%
- November 14%
- December 18%
- January 18%
- February 12%
- March 11%
- April 7%
- May 4%
- June 2%
- July 1%
- August 2%
- September 3%

Roseburg Irrigation weekly Needs

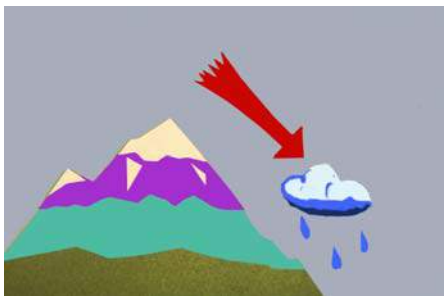
- January 0
- February 0
- March 0
- April .4
- May 1.0
- June 1.5 inches
- July 1.9
- August 1.6
- September .9
- October 0
- November 0
- December 0

(Tree fruit, berries)

Precipitation and Topography (Windward Side High Rainfall)

Cooling air releases moisture

Precipitation and Topography (Leeward Side Rain Shadow)



Warming air holds moisture

Oregon Annual Precipitation

Precipitation Zones

- Rainfall zones exist relative to topography

Microclimates in Douglas County

Cool air flows like water to low lying areas while warm air rises, fog is formed. Hillside slopes become the warmest zone.

Frost Free Period

Site	last	first	FFP
Roseburg	4/15	11/10	210
Medford	4/26	10/21	176
Portland	3/1	11/24	268
Corvallis	4/15	11/1	200
Klamath Falls	5/20	9/25	128
Madras	6/25	8/25	59

Extend the Growing Season

- Extend the growing season through woven fabric row covers, plastic hoops, raised beds, black plastic or woven mat.


Methods to Extend the Growing Season



Wind Machines for Frost Protection

- When do they work? Warm air inversions
- Warm air aloft is pulled down to mix with cool air in low spots
- Will not work well when cold arctic air spills into Oregon from the north

Irrigation for Frost Protection

- Sprinkling water over plants for frost protection works because:
- When water cools it gives up a fixed amount of heat for each degree of temperature loss.
- If water application is continuous, the temperature of the plant tissue will remain at or above 31.5^{o}F. even though a layer of ice is steadily being formed.

Cold Hardiness in Woody Perennial Plants

- Affected by water and nutrients
- Gradually dry off plants to harden in early fall, (September)
- Foliar N in late summer or fall ok, soil applied N can cause late growth and winter injury
- Calcium availability aids winter hardiness

Wind

- One of the lowest wind velocities in the U.S.
- Generally less than 8 mph on average
- Winter storms come from the southwest
- Hard freezes push in from northeast
- Cool summer breezes come from the west
- Warm or hot winds come from the southeast or east

Day Length at Various Latitudes

Latitude	June 21	Dec 21
10°	13.5	12.4 hrs
20°	14.2	11.8
30°	15.0	11.2
40°	16.3	10.6
45°	17.0	10.1
50°	17.8	9.5

Solar Radiation (day-length)

- Roseburg about 43 degrees N latitude
- 1700 hours of sunshine on average
- Day-length on June 21, 17 hours
- Day-length on December 21, 10 hours

Growing Site and Slope

- Slope can be beneficial to cold air drainage in frost season
- Slope also can improve light intercept to plants during cooler spring and fall seasons
- Slope adds heat units (3 deg/day) hi-lo, steepness and direction dictate
- Slope improves water drainage
- Slope can be a tool to reduce vigor or delay budbreak in spring

Open Hillside Site

Growing Site and Aspect

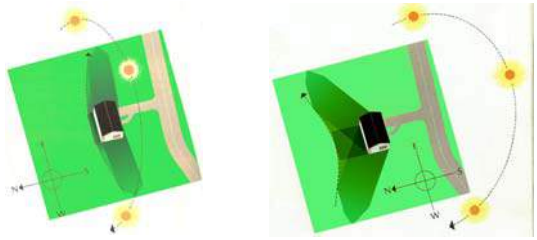
- Eastern aspect site warms faster in am, but pm temperature and maximum temperature higher on a southwestern aspect site
- To help equalize sunlight over the canopy run rows slightly SE and NW of true N-S, reduces sunburn too

Local Topography

- Cool air settles into low spots or swales, this can cause uneven ripening
- Swales and tree lines can increase frost
- Swales and low spots can also accumulate more moisture creating high vigor spots or root rots
- Steep hills have different rates of maturity from top to bottom

Local Topography and Shade

- Know the sun track in summer and winter
- Choose garden sites for summer track
- Summer Winter



Soil Types

- Successful gardens can be grown on a wide variety of soil types
- Identify soil type zones across your property and match them with the right plants for your site needs

Knowing Soil Temperature is Critical for Germination

RECOMMENDED MINIMUM SOIL TEMPERATURES FOR VEGETABLES (° F)							
Asparagus	30	Radish	40	C. cabbage	45	New Zealand spinach	50
Rhubarb	30	Rutabaga	40	Endive	45	Muskmelon	60
Beet	40	Spinach	40	Garlic	45	Tomato	60
Broccoli	40	Turnip	40	Leek	45	Eggplant	65
Cabbage	40	Artichoke	45	Lettuce	45	Okra	65
Chard	40	Carrot	45	Onion	45	Pepper, hot	65
Kale	40	Cauliflr	45	Pea	45	Pepper, sweet	65
Parsnip	40	Celery	45	Beans	50	Watermelon	65

Diurnal Temperature Fluctuation

- The difference between daytime highs and night time lows in degrees.
- In the Umpqua Valley diurnal temperature fluctuation in summer is often 30-40 degrees
- This can inhibit your success when trying to grow warm season crops (peppers, okra, melons, tomatoes)

Understanding the Dynamics of Climate, and Site

- Allows gardeners to better match varieties to our area
- Leads growers to use north and east exposures for cool crops in summer, and south or west exposures for heat loving crops
- Can help eliminate frost and vigor pockets

Climate Related Gardening Terms

- Vernalize: Low temp stimulation for flowering
- Dormancy: Temperature induced rest period
- Chilling requirement: necessary hours of cold to break dormancy
- Plant hardiness: Ability to withstand cold
- Macro, Micro, Meso Climate: Interaction of climatic and topographical elements on large, medium, and local sites

Climate Change: What is Changing?

- In Western Oregon climate change has been documented through primarily warmer low temperatures, especially in winter.
- Some trend to longer dry periods during summer

Milder Winter at High Elevation

- Snowfall is not accumulating all winter
- Snow is deposited for awhile then melts, then is deposited again, etc.
- This freeze thaw pattern leads to early water loss for summer irrigation, nutrient leaching and runoff, and N loss to the air

Negative Impacts of Milder Winters

- Low chill requirement trees coming out of dormancy earlier, leads to frost damage
- Apricots, 1 crop in last 10 years
- Japanese plums 2 crops in the last 10 years
- Growers forced to plant more late blooming varieties with tree fruit
- Low snow pack reduces irrigation supply in summer

Negative Impacts of Milder Winters and Drier Summers

- Insect pests are surviving winter temperatures, mating earlier, having more generations per year
- Pine borers attacking stressed forests
- Spotted Wing Drosophila, Peach tree borers, peach twig borers, and mealybugs all more active

Impact of Milder Winters

- As growing season gets longer and warmer:
- Increase winter weed growth, and new weeds will move into our area (star thistle, distaff thistle, Japanese knotweed, knapweed
- Higher disease pressure in grains, grass seed, vegetable crops, ornamentals, forestry

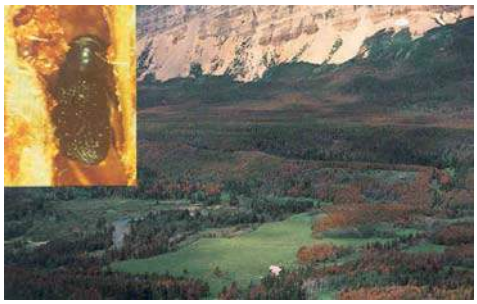
Impacts on Plant Productivity

- Plant growth rates increasing in high latitude regions (45-55 degrees)
- Climate change is extending the growing season and CO2 concentration is increasing.
- With total heat units increasing, ripening of tree fruit, grapes, and berries accelerating

Impacts on Trees

- Greater heat and drought stress on tree species leads to insect infestation and tree dieback
- Lodgepole pine infested by bark beetles causes dieback on 150,000 acres in S. Oregon
- Ponderosa pine attacked by pine butterfly on over 250,000 acres in Eastern Oregon

Mountain Pine Beetle



Planning for Climate Change
Tree Fruit and Grapes

- Slope can be beneficial to cold air drainage in frost season
- Slope and aspect together can reduce light intercept to soils slowing spring bud break and growth. The drier hillside site can also reduce vigor

Planning for Climate Change
Vegetable Crops

- Warm weather crops will have a longer growing season improving prospects (tomatoes, peppers, melons-squash, okra)
- Cool weather crops will need to be planted earlier in spring and later in fall (cabbage, broccoli, peas, lettuce, garlic, onions)
- Winter gardens more productive

Respiration of Fresh Produce

- As with growing plants, the rate of respiration of stored products is directly correlated with temperature:
- Heat increases and cold decreases the respiration process.
- Harvesting in the morning when the product is cool will permit longer retention of quality.

Why Xeriscape is an Answer to Climate Change

- Water conservation
- Easier maintenance
- Better plant health
- Saves money

Average Water Use Per Person/Day 1993

Average Monthly Water Use for the City of Roseburg

- Winter months, 4 million gals/day
- Summer months, 10.5 million gals/day
- Where is that water going?

Xericscapes in Oregon

Why Use Rain Gardens?

- Beautiful and easy to incorporate
- Conserve water, recharge groundwater
- Reduce standing water in your yard
- Plants tolerate drought and excess rainfall
- Create habitat for beneficial insects, birds and butterflies by using native plants

Rain Gardens

Rain Gardens Cover Soil

The Value of the Umpqua to Buffer Climate Change

- Most equitable growing location in the state, 205 day growing season, ample heat units, marine influence
- Rogue has 4-5,000 ft ridges between the valleys and the ocean. 20 degrees warmer in the am during summer mornings, but cooler days in spring and fall (frost)
- Willamette Valley has good marine influence but can lack heat units

Recap Climate Change

- In Western Oregon climate change is seen in warmer low temperatures, especially in winter
- Trees coming out of dormancy earlier
- Fruit trees seeing increased frost risk
- Insect pests killing stressed pines
- More invasive insect pests
- Higher disease pressure
- Increased winter weed growth

Climate Change Trend

- Making 30 year average temperatures and moisture records less reliable for forecasting normals
- 20 year averages, and even 10 year averages may end up being more accurate
- “As time goes on, we’re becoming less comfortable about using history as a predictor” NOAA regional director

Future Climate Change Impacts

- More winter rainfall and water supply +3%
- Less snow pack for summer irrigation
- Small increase in irrigation demand as summer temps trend higher
- Longer growing season
- Degree day accumulation increase
- Decrease in summer soil moisture