Climate Change and Northwest Oregon Gardens

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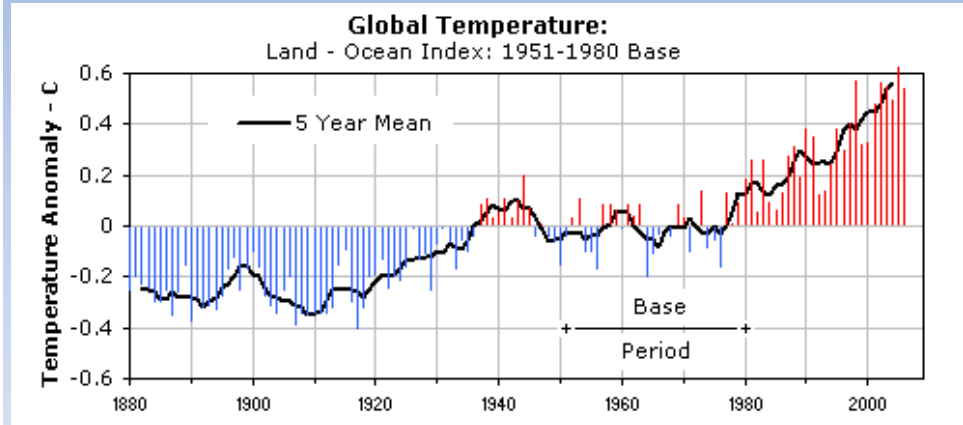
Rapid pace of warming



The Pace of Climate Change

- The rate of change is different from other climate change events.
- The speed of warming will impact native landscapes and the interdependent living things within them.
- Species that reproduce slowly will have the most trouble adapting.

In response to climate change, plants can:

- **Move** to where the climate is suitable
- **Adapt** to the new climate
- **Become extinct**

It is hard for some plants to just move

- Physical barriers
- Complex reproduction process
- Very specific environmental requirements
- Low gene flow

Adaption is complicated

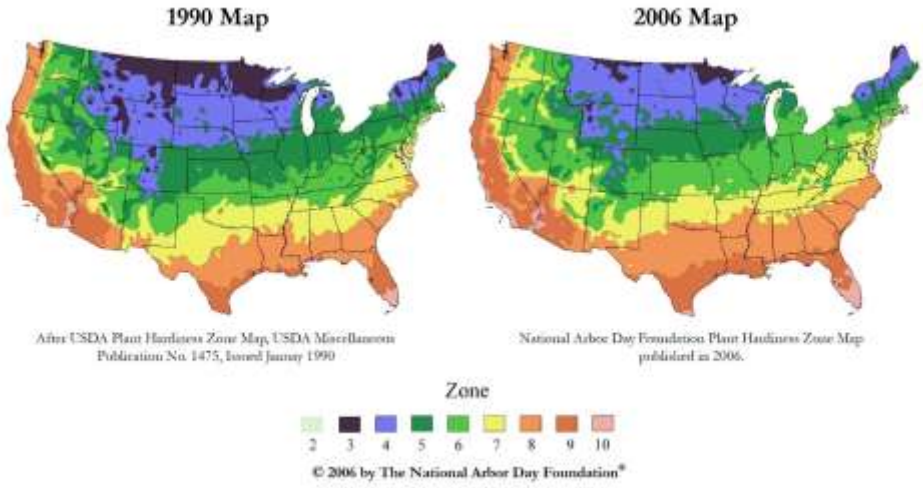
- Not all species will adapt to climate change at the same rate
- Plants that flower too early may 'miss' their pollinators
- Migrating birds might not have a food supply where they expect it
- Low gene flow

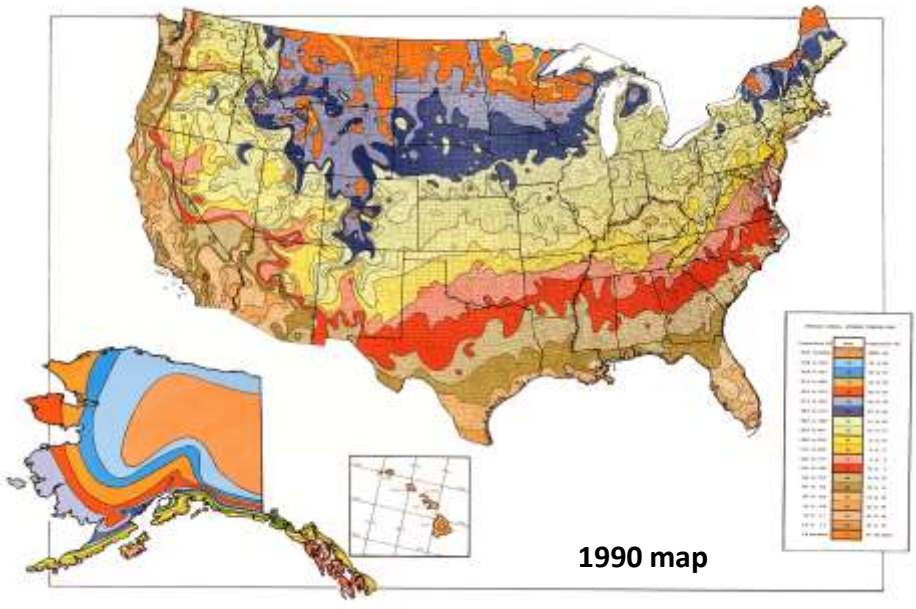
Physical Elements of Climate Change

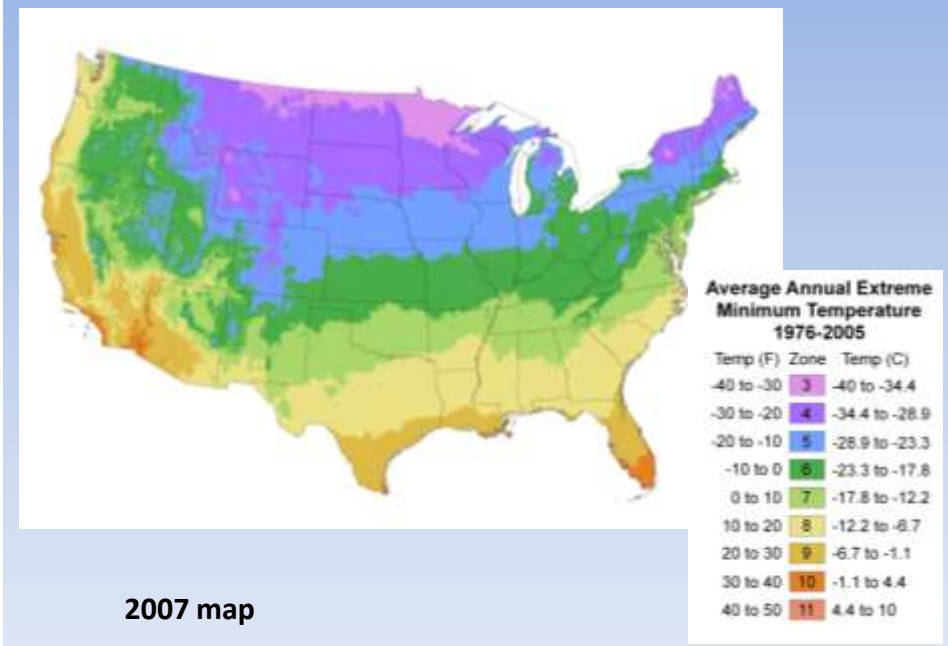
- High and low temperatures
- Frost intervals
- Heat units
- Rainfall patterns
- Extreme weather events

Plant Cold Hardiness Zones: Revised in 2007 from 1990 map

- Maps show extreme cold event average over about 30 years
- Important for woody and herbaceous perennials and biennials.
- Change dramatic in some parts of the country – less for the PNW
- Still, it reflects a change in growing conditions


1990 Map
2006 Map
After USDA Plant Hardiness Zone Map, USDA Miscellaneous Publication No. 1475, Issued January 1990
National Arbor Day Foundation Plant Hardiness Zone Map published in 2006.
Zone
2 3 4 5 6 7 8 9 10
© 2006 by The National Arbor Day Foundation®

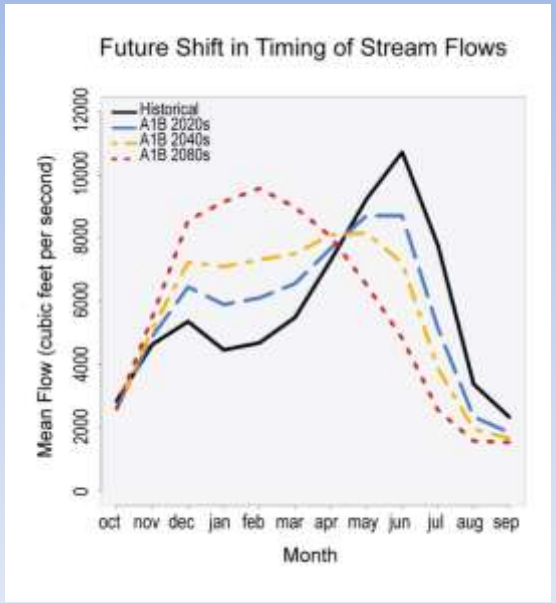

1990 map

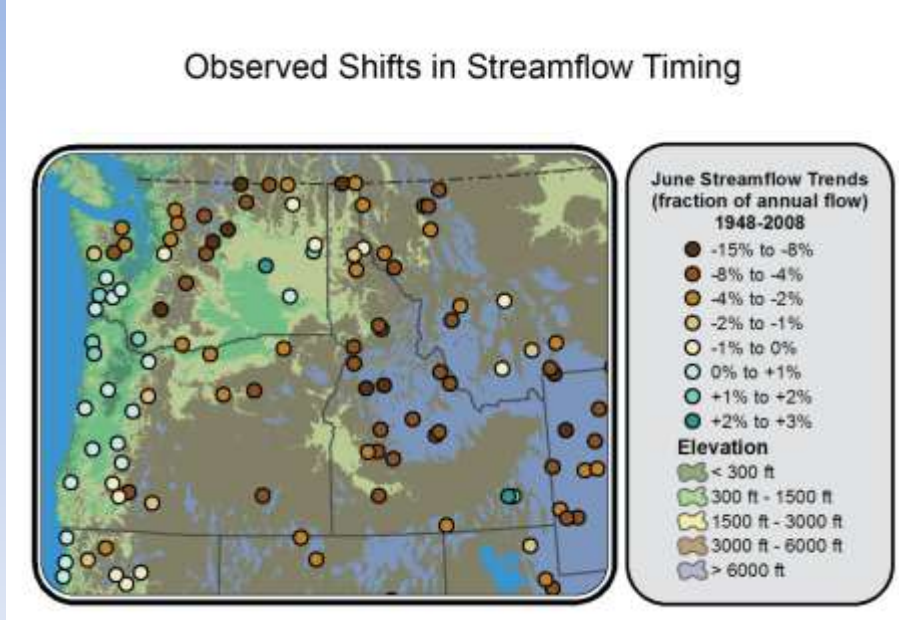

Average Annual Extreme Minimum Temperature 1976-2005
Temp (F) Zone Temp (C)
-40 to -30 3 -40 to -34.4
-30 to -20 4 -34.4 to -28.9
-20 to -10 5 -28.9 to -23.3
-10 to 0 6 -23.3 to -17.8
0 to 10 7 -17.8 to -12.2
10 to 20 8 -12.2 to -6.7
20 to 30 9 -6.7 to -1.1
30 to 40 10 -1.1 to 4.4
40 to 50 11 4.4 to 10

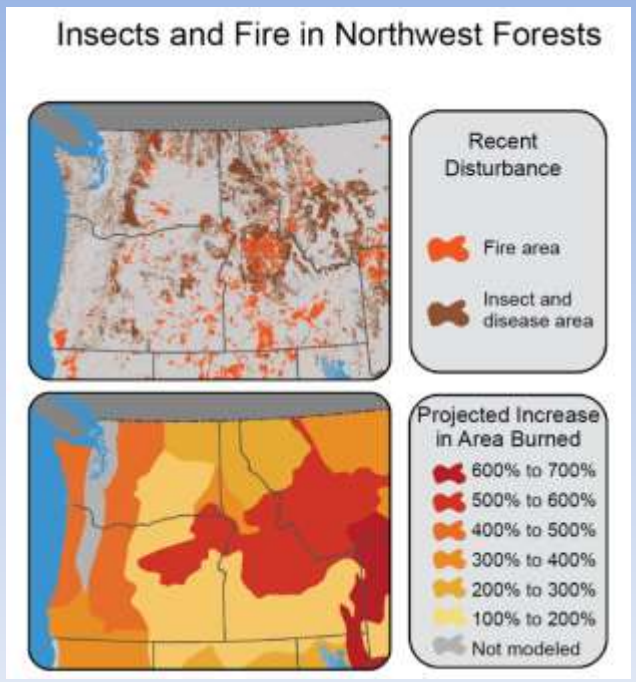
2007 map


USDA Plant Hardiness Zone Map
Oregon
Average Annual Extreme Minimum Temperature 1976-2005
Astoria
Portland
SALEM
Newport
Corvallis
Eugene
Coos Bay
Bend
Pendleton
Baker City
John Day
Ontario
Burns
Medford
Klamath Falls
Lakeview
ars Agricultural Research Service
OSU Oregon State

Stream flows







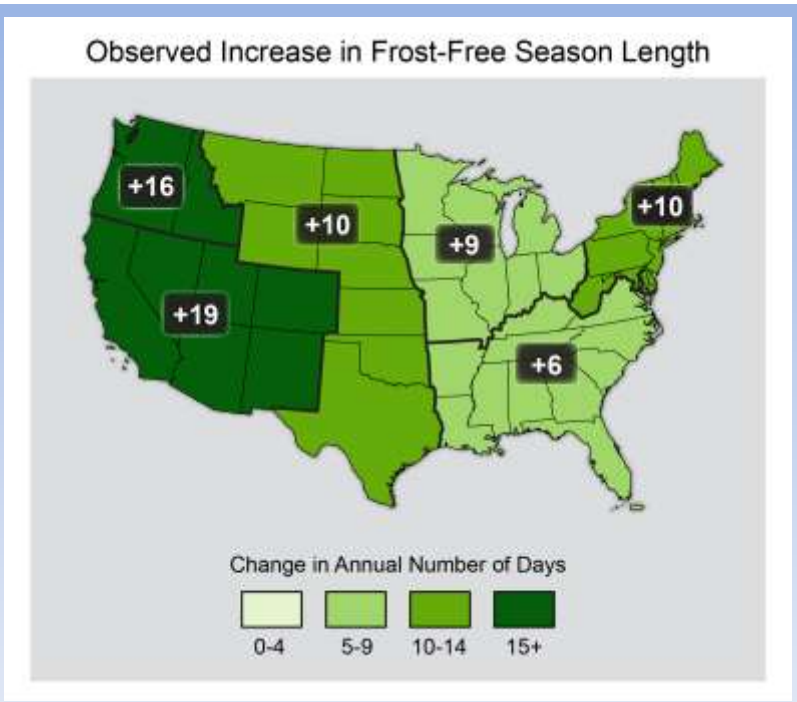
Extreme weather events

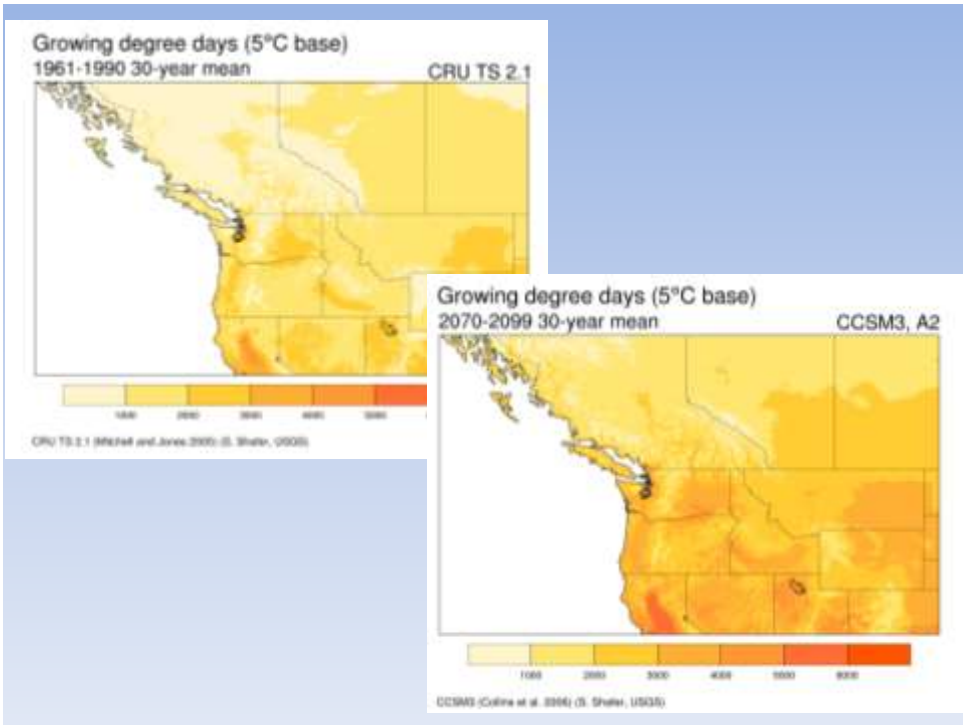
- Weather patterns less stable?
- Will there be more extreme floods?
- Will persistent summer droughts be more common?
- Unexpected cold snaps?

Vernonia 2007

Climate change and gardening

- Frost free intervals
- Growing degree days (heat units)
- Pollination
- Insect and disease changes
- Weed impacts
- Water for gardening
- Plant choices
- Cultural choices



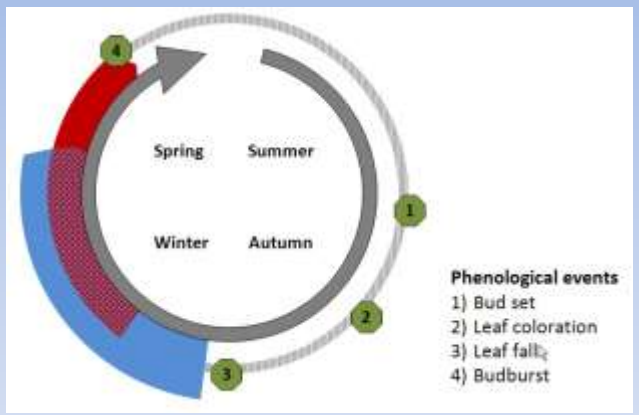


Crop implications of increased frost free days and more heat units

- Earlier transplanting and/or seeding of frost sensitive crops (assuming soil drainage is ok).
- More rapid early growth and longer growing season – more yield?
- Combined with the greater heat units, more crop options

Plant phenology

- Plants have to get through winter
- Phenology cycle
- What might climate change do to those cycles?



More plant phenology

- Winter chilling critical for dormancy release
- Spring warming cues bud break and regulates leaf expansion rates
- Drought can speed senescence; frost & cooling temperatures cue leaf drop and dormancy in fall

Climate change may slow winter dormancy

- Trees may grow longer & sequester more carbon.
- Trees may be more prone to early cold temps, but leaf drop/dormancy is typically daylength driven.
- Forest floor vegetation and higher species may be affected by changes in leaf drop timing & volume.

Bud break after winter

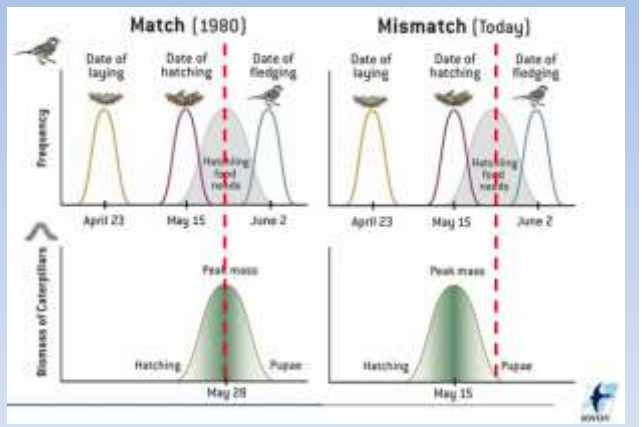
- This could get a bit complex…..
- Fruit (and other trees and shrubs) trees bloom once their chilling requirement is satisfied and the subsequent temperatures warm.
- Climate change could slow chilling or perhaps only affect the emergence times post chilling. Or neither.
- Are there potential issues with earlier emergence?

Bud break issues

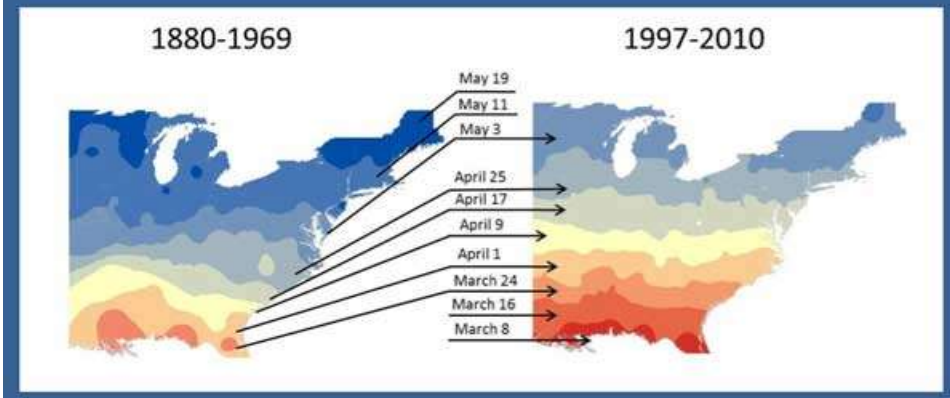
- Frost damage (buds, flowers) more likely?
- If not sufficiently chilled, fruit can be abnormal.
- Will bloom be in sync with pollinator emergence?
- Others?

Growth cycle changes can affect other dependent species

- Insects are cued to emerge as leaves and/or fruit are formed
- Birds feed on those insects

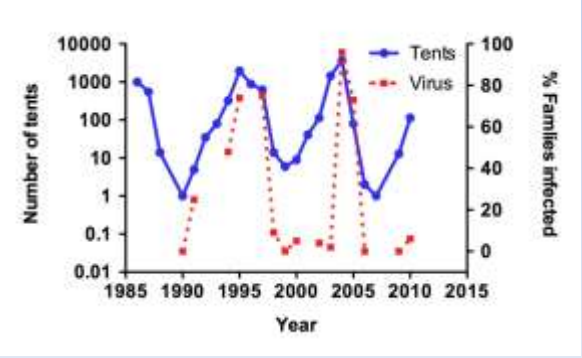


Hummingbird First Arrival Dates



Insect predator prey relationships

- Destructive insects may be able to escape (to some extent) predation
- Or, insect parasites could become more efficient in reducing pest populations



Some insect generations may increase

Yellowjackets start colonies earlier

- Colonies would probably be larger
- Might improve insect predation
- Could increase sting incidents

Weed adaptability in climate change

- Many of our worst weeds are most able to take advantage of a CO_2 enriched environment.
  - Canada thistle
  - Poison oak\ivy
  - Some annuals
- Herbicides might not be as effective but bio-controls might be better (or not).
- Weed shifts

It may all come down to water

- PNW projections are for stable rainfall west of the Cascades with less snow.
- But more rain as high intensity storms which increases runoff.
- Competing demands
- Impact on water for irrigation
  - household wells and municipal water supplies
  - agricultural wells
- Water management will become more important

Water management in climate change

- Water will become more expensive
- Extended season may require more water use
- Irrigation techniques will transition to the most efficient systems
- Compost will be a big deal in landscapes and farms. So will cover crops
- However, higher temperatures > the rate of turnover if moisture is not limiting.
- Landscape plant material selection will favor low water use plants that support native species

Other steps you can take to slow climate change and decrease impacts

- Minimize carbon inputs
  - Use more cover crops and compost
  - Calibrate synthetic nitrogen use to plant need
  - Use gas-powered garden tools thoughtfully
  - Use less peat (coir and compost as alternatives)
- Grow more food on your lot
- Plant lawns that require less water and mowing

Planting for climate change

- Use plants that support native species (birds, insects, etc.) where possible.
- Where reasonable, use plants adapted to our dry summers and wet winters.
- Assisted migration concept
- Plant trees where appropriate to capture CO_2 and provide shade to reduce summer air conditioning.