

# Climate change and crop phenology

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# Phenology [fi-nol-uh-jee]

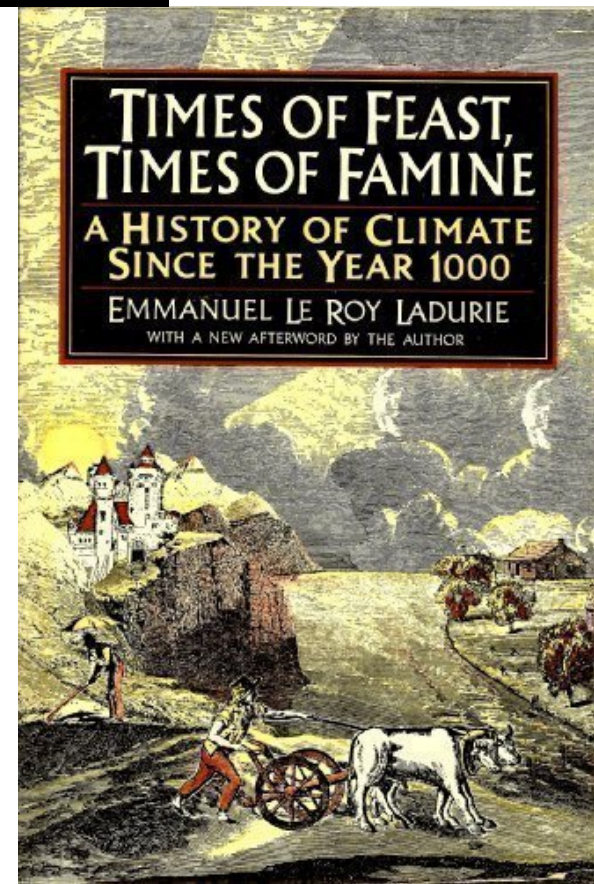
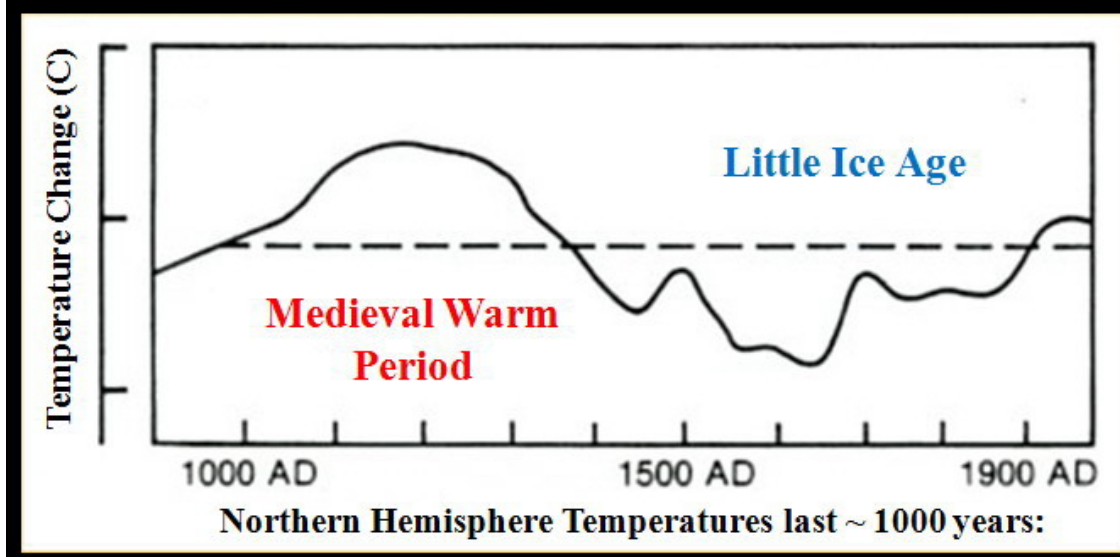
The study of **environmentally influenced regular events** in the lifecycle of organisms

## Examples

- Leaves emerging in the spring
- Bird migration
- Plants blooming

## Environmental factors

- Temperature (heat or cold accumulation)
- Photoperiod (day length)

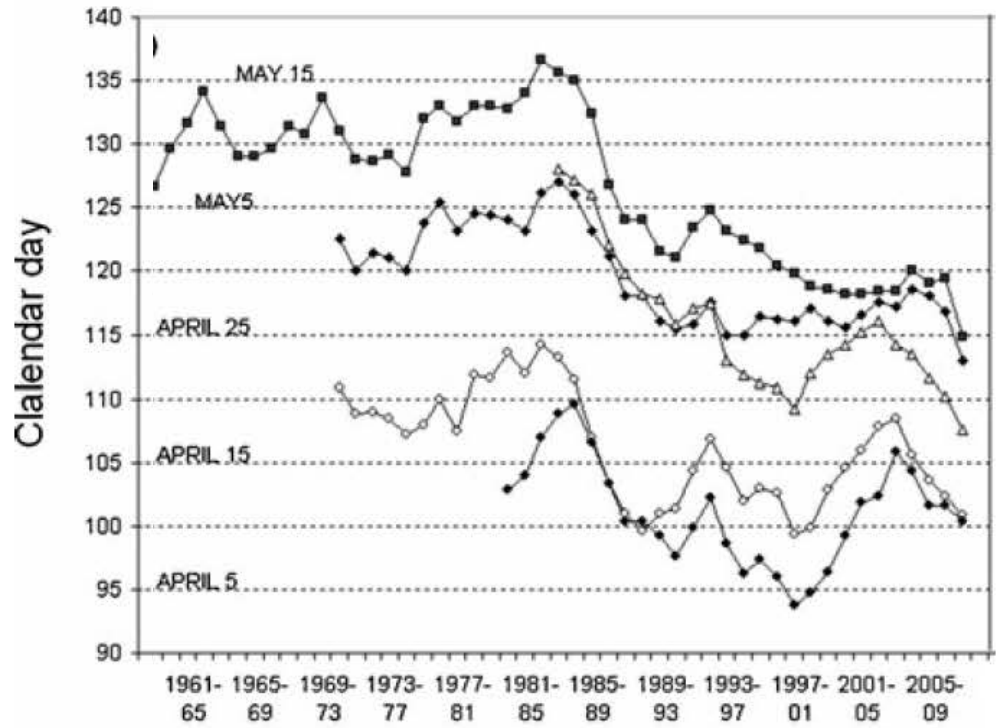




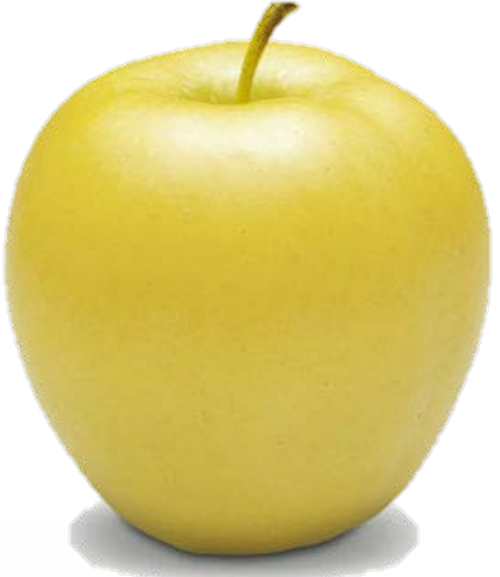
# Apple bloom in Europe



Golden delicious



○ Gembloux   ■ Bonn   ● Conthey   ▲ Trento   ▲ Angers   ◇ Forli   ◆ Nimes









# California tree crop phenology and climate (change)

- **Warm winter can delay spring phenology**

Winter chill needed to wake up

- **Warm spring can advance spring phenology**

Need warm weather to come out

- **Warm spring advances harvest**

Fruits and nuts mature faster

# Data

## Almond:

Chico (4 varieties), 1933 — ; 1983 — (5 varieties)

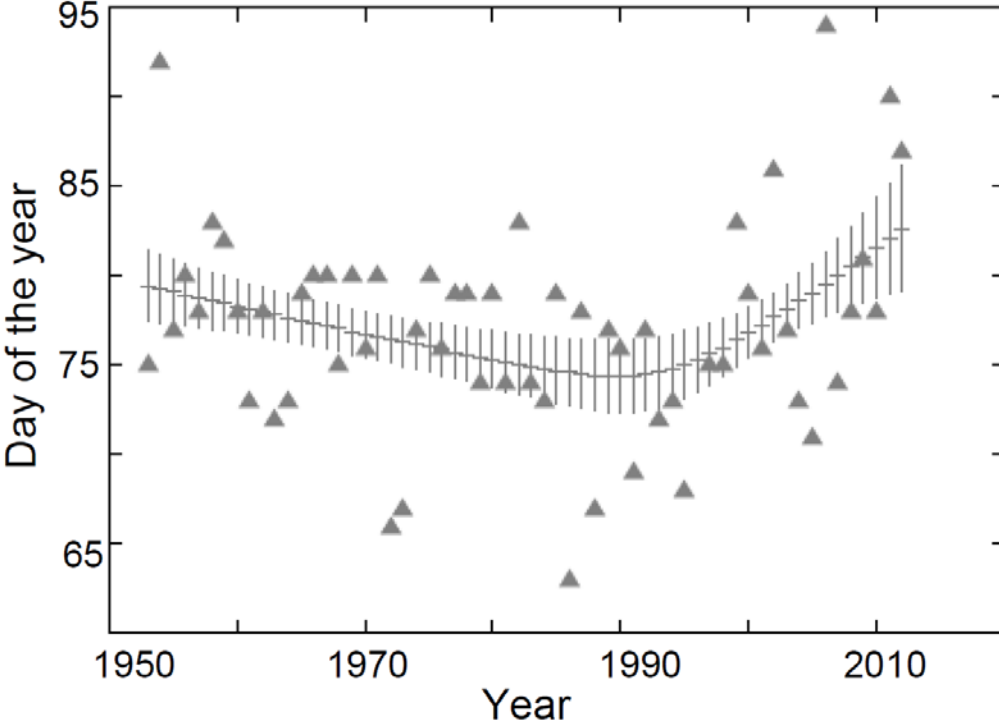
Modesto (7 varieties), 1983 —

Shafter (7 varieties), 1996 —

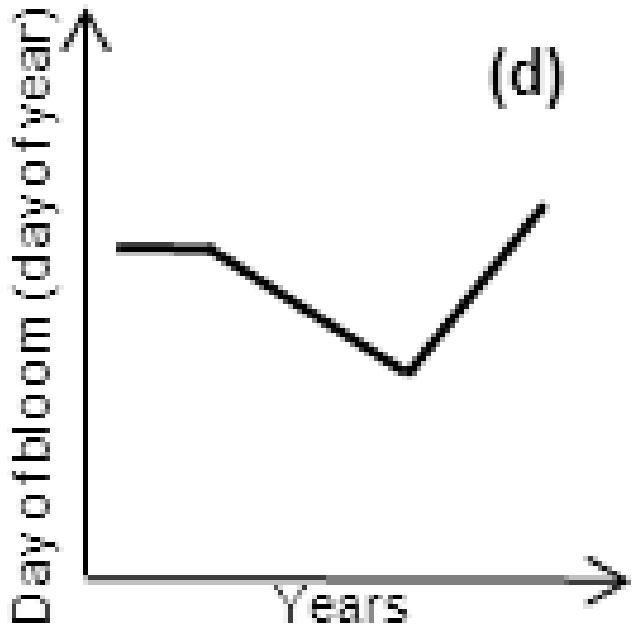
Prune: Parlier and Winters, 1998 —

Walnut : Davis (7 varieties), 1954 —

# Walnut leaf-out

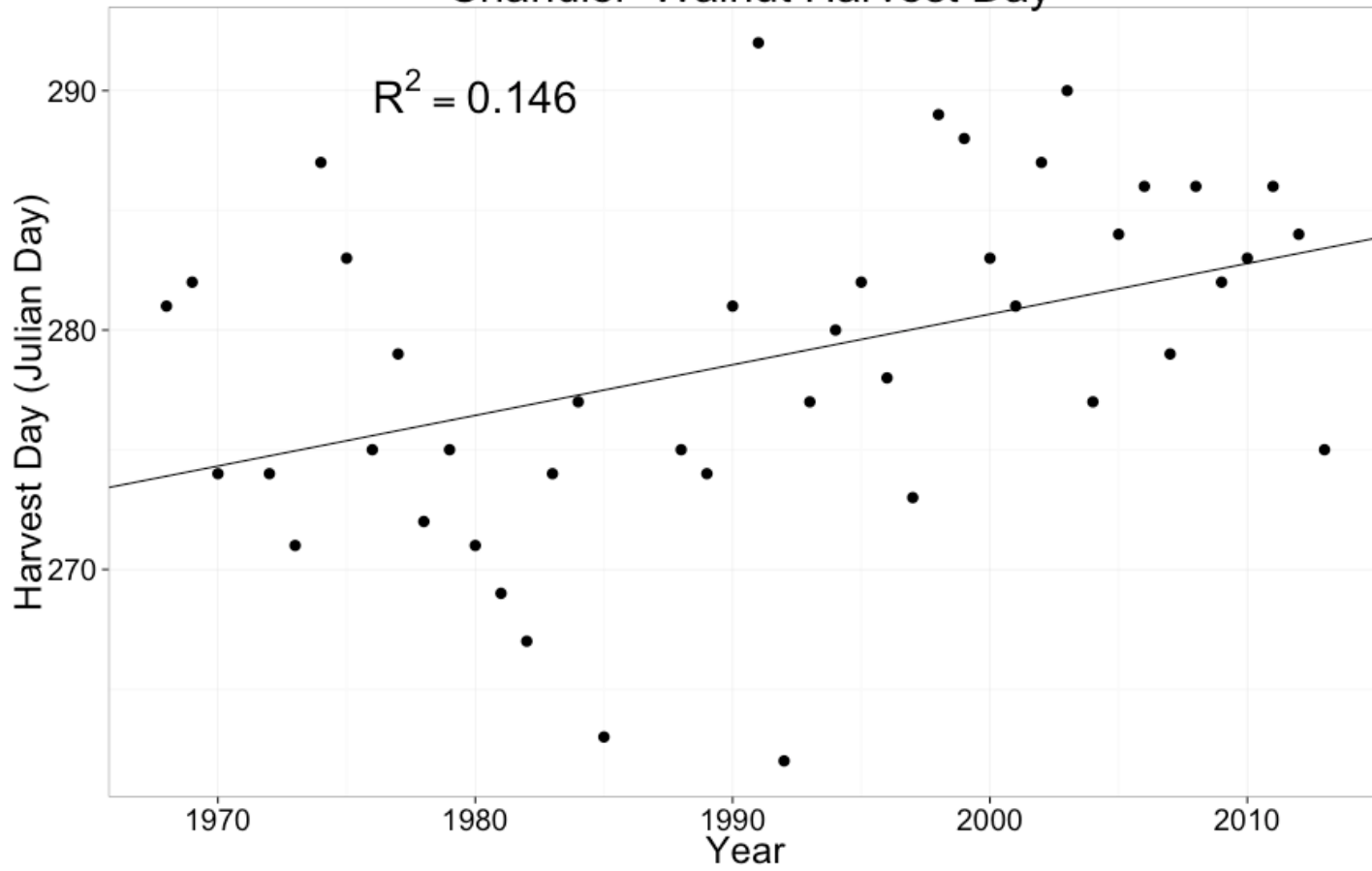


Leaf-out timing, 'Payne' walnuts, Davis, CA

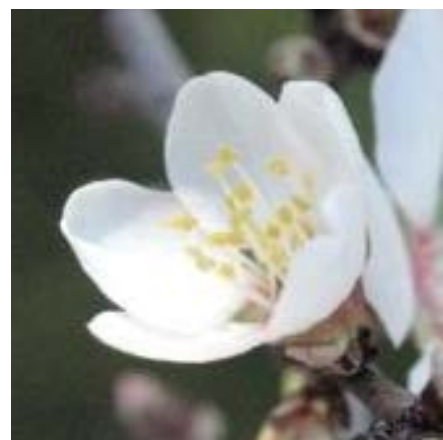
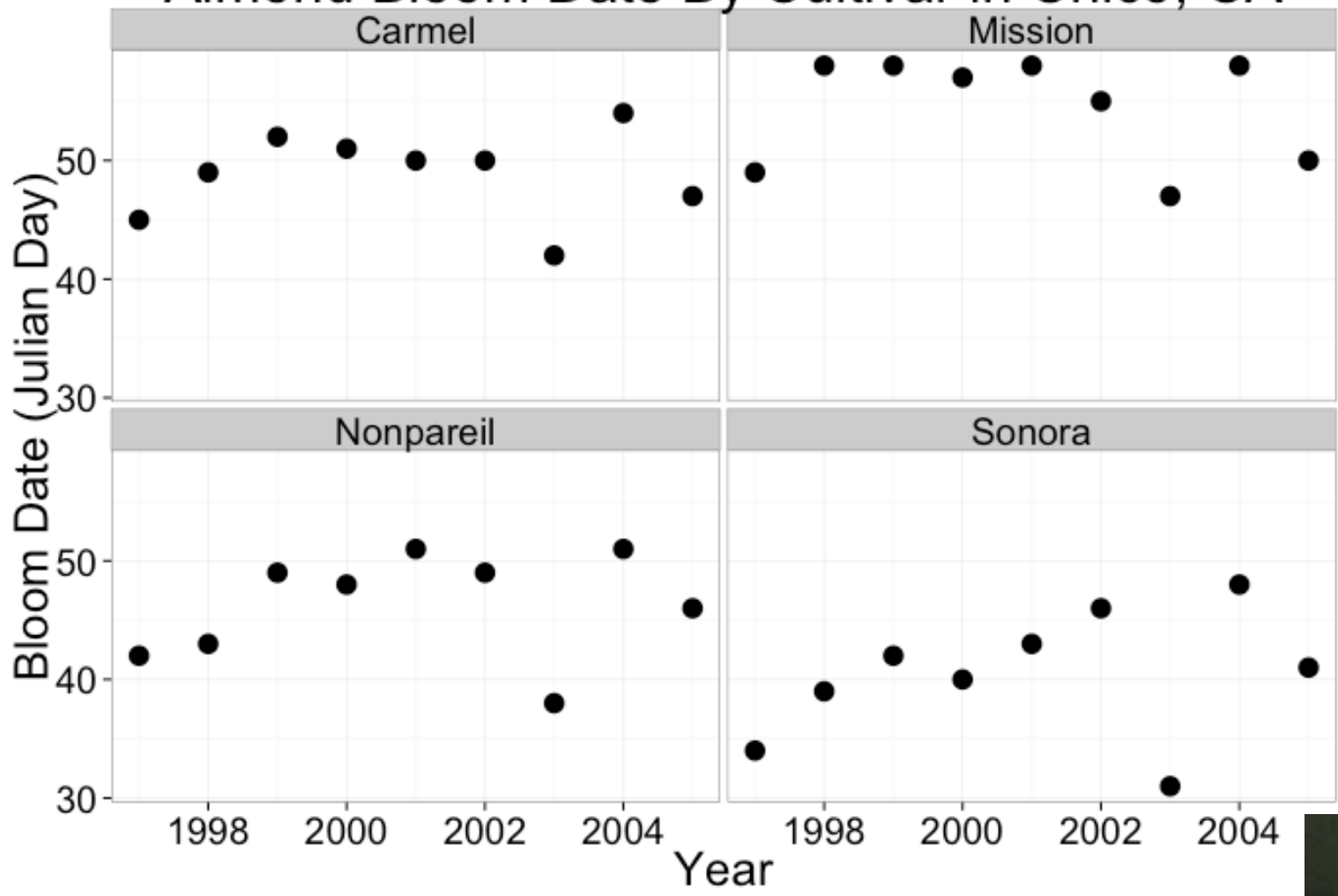




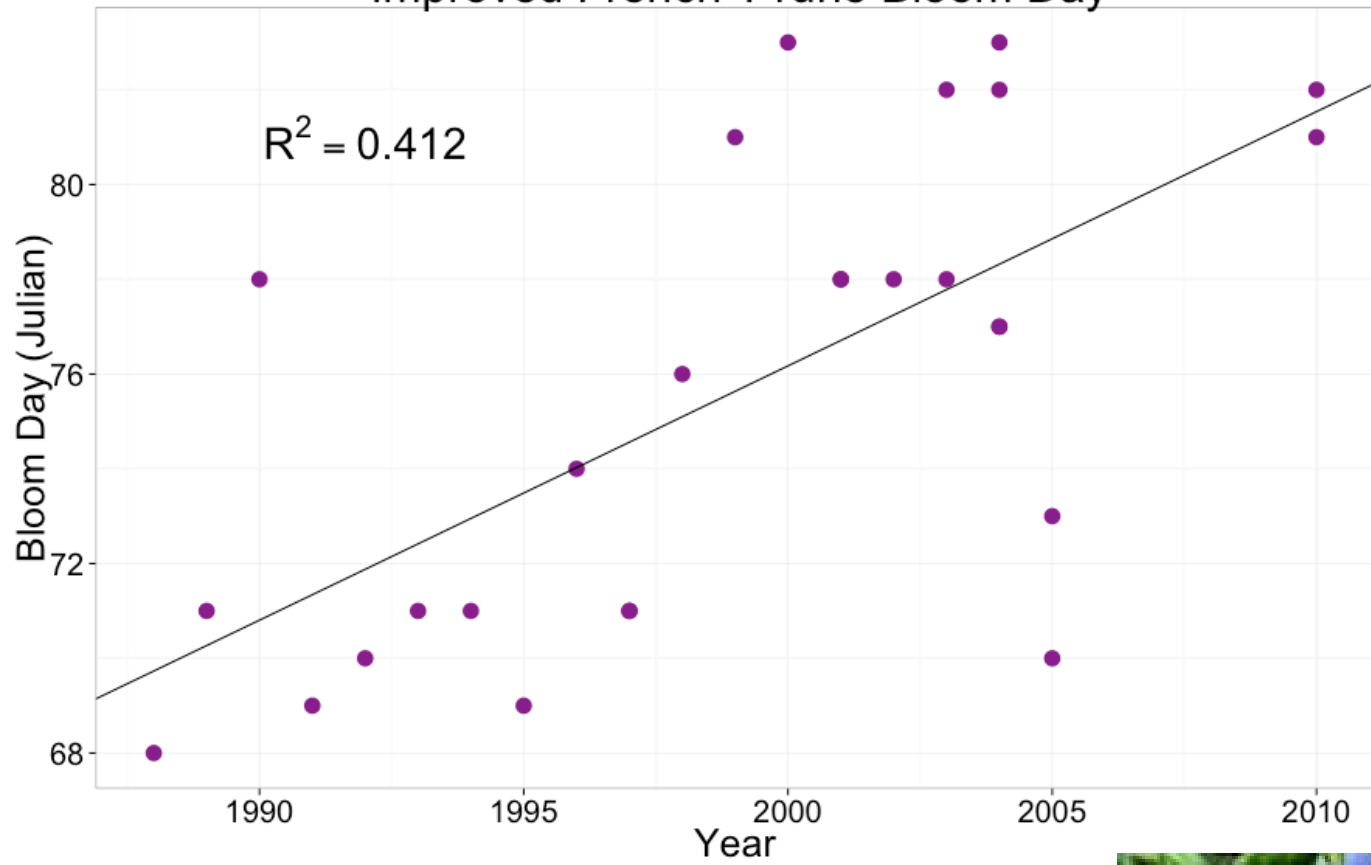
# 'Chandler' Walnut Harvest Day



# Almond Bloom Date By Cultivar in Chico, CA

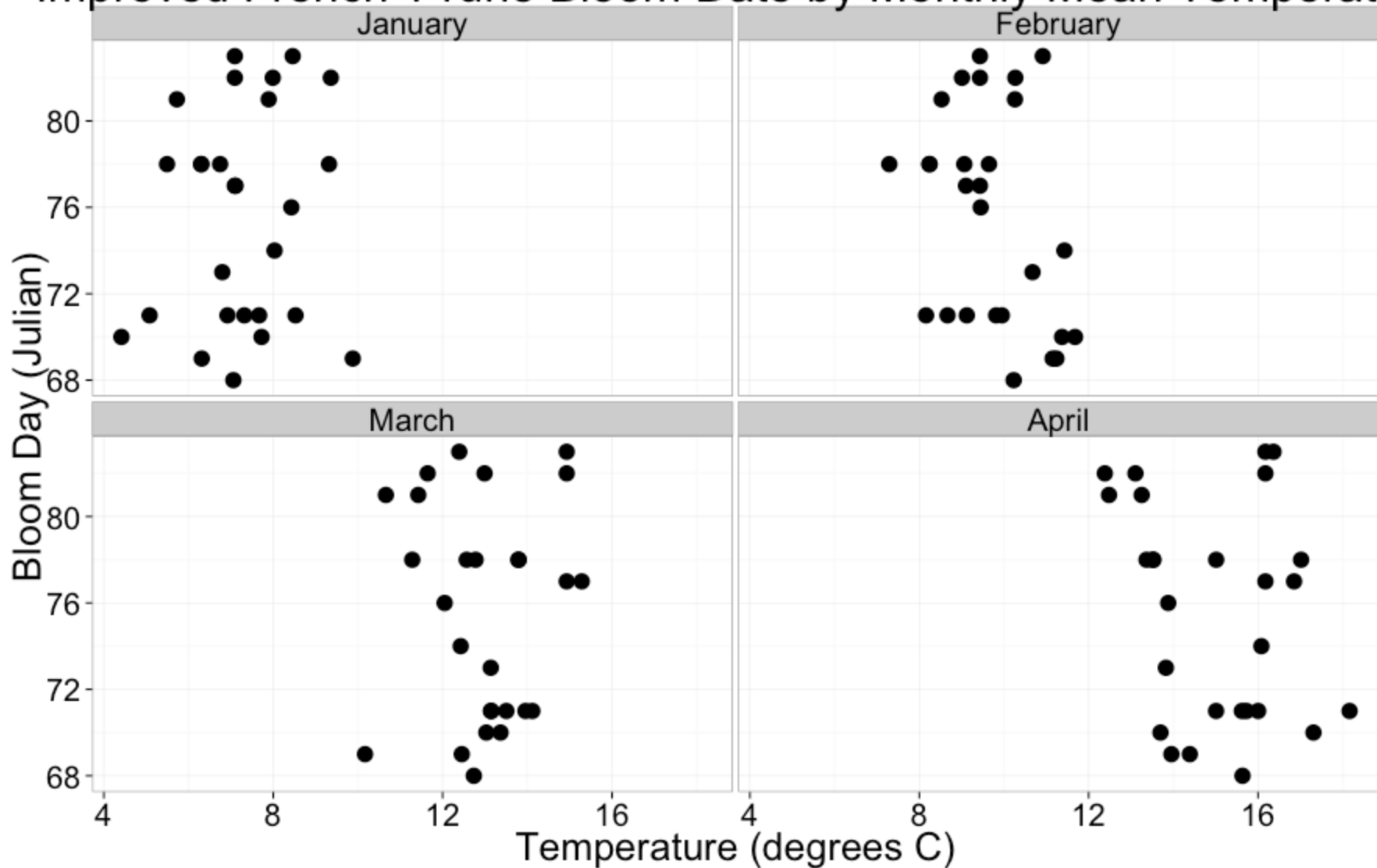


# 'Improved French' Prune Bloom Day





# 'Improved French' Prune Bloom Date by Monthly Mean Temperature





Kenny Calhoun Photography