

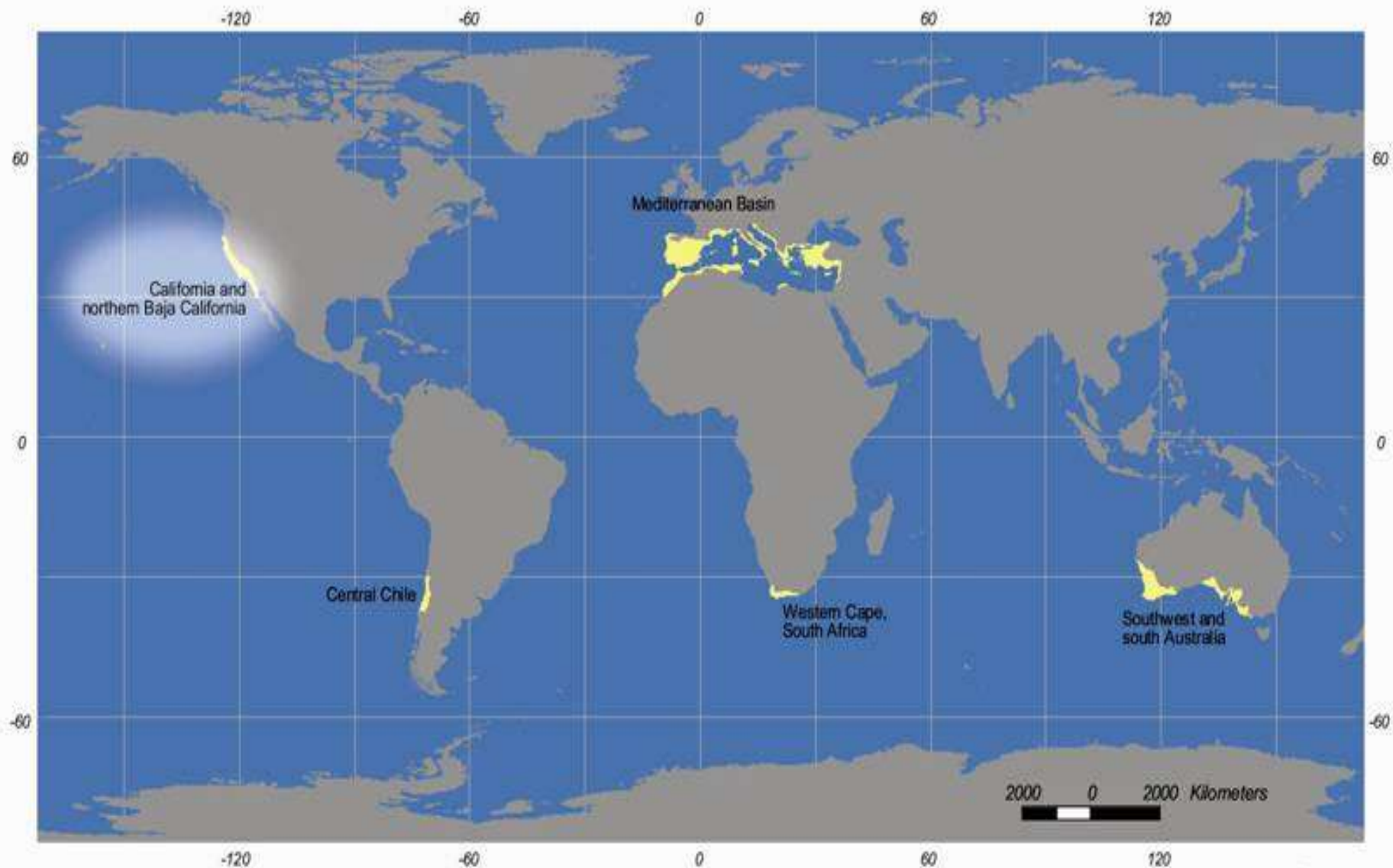


The Effect of Aspect on Air and Ground Temperature in Microenvironments of the Santa Monica Mountains of Southern California

Henry Ortiz

Institute Director

Santa Monica Mountains Institute



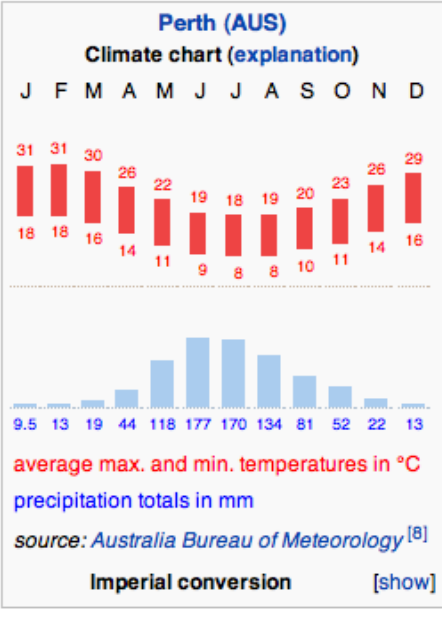
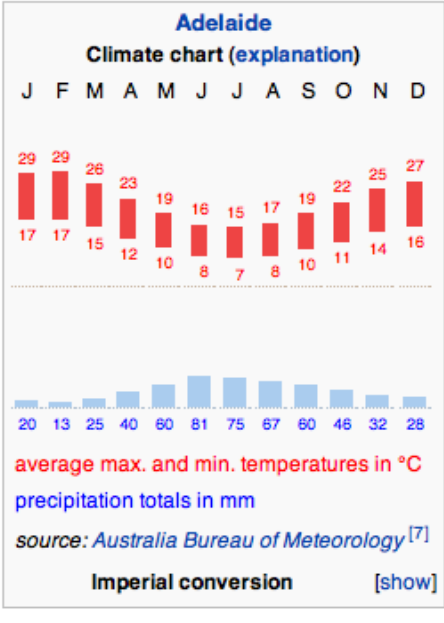
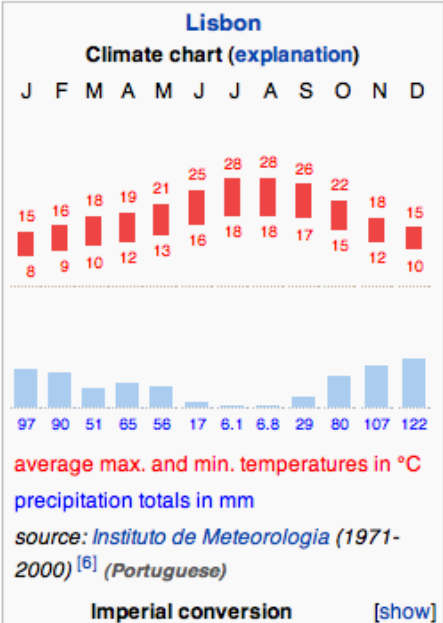
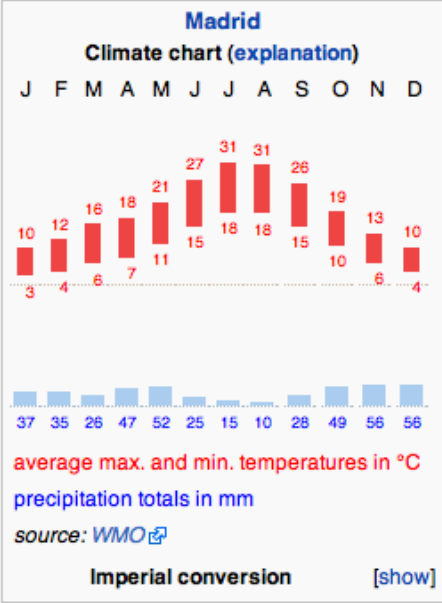
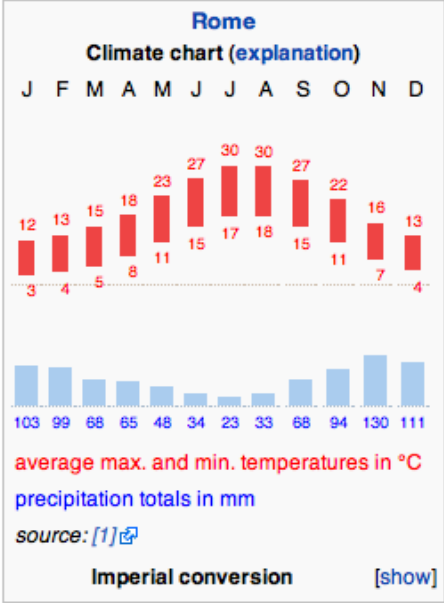
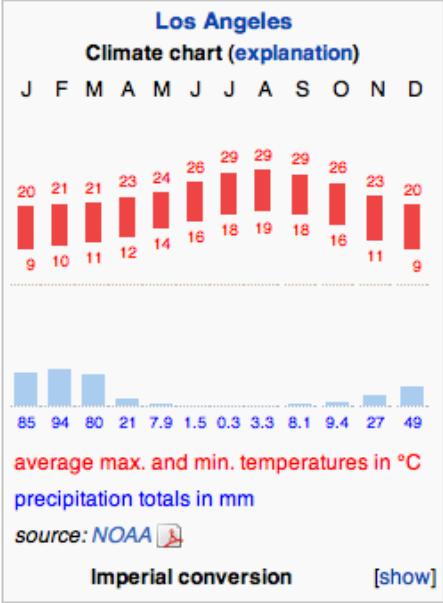
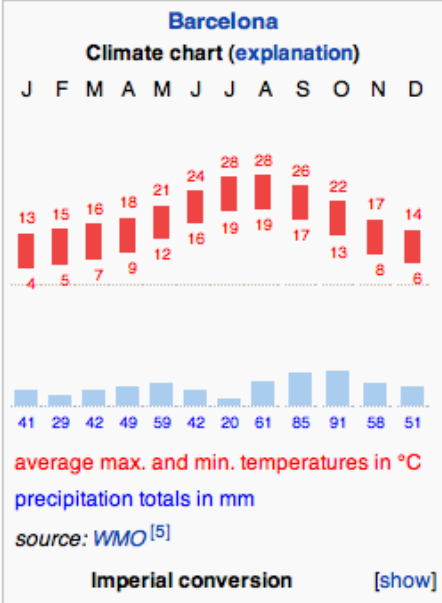
Mediterranean Climate Regions

Map based on information from "Plant Life in the World's Mediterranean Climates", Peter R. Dallman, 1998, University of California Press, Berkeley, California.



N

Hot Summer Mediterranean Climate



San
Joaquin
Valley

Mojave
Desert

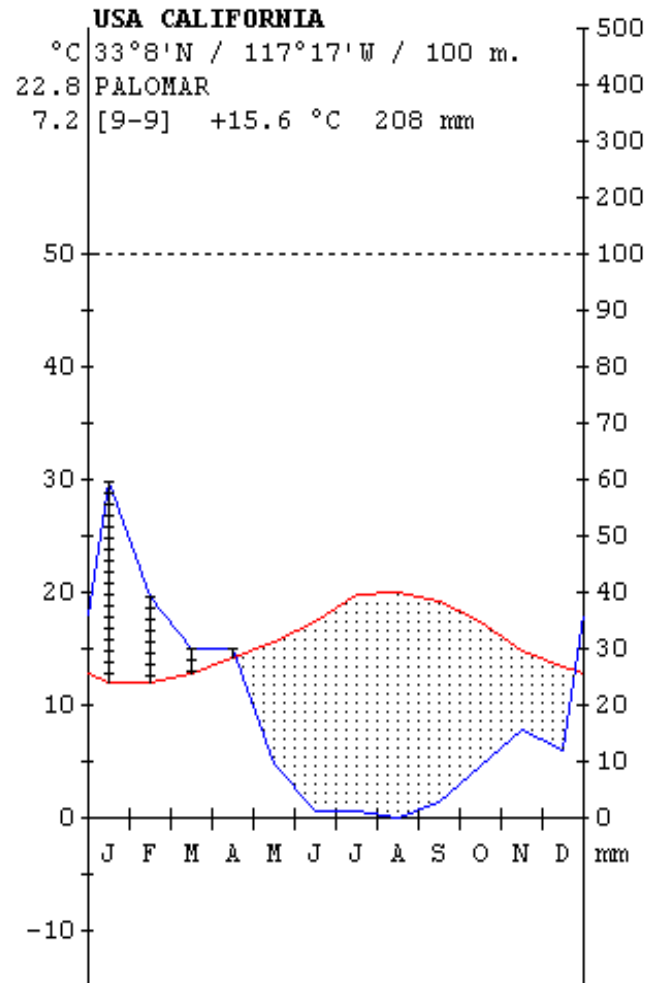
Santa Monica Mtns.

Los
Angeles

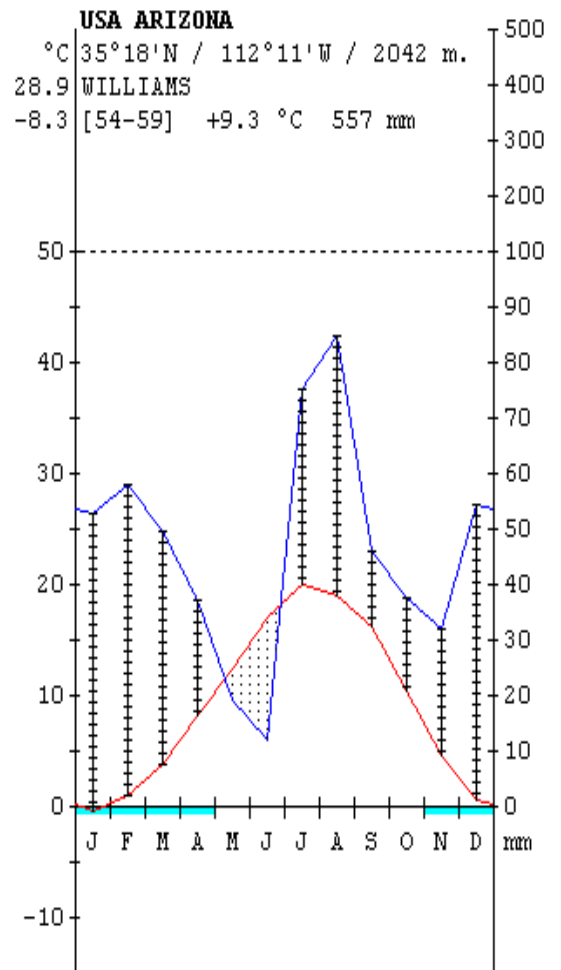
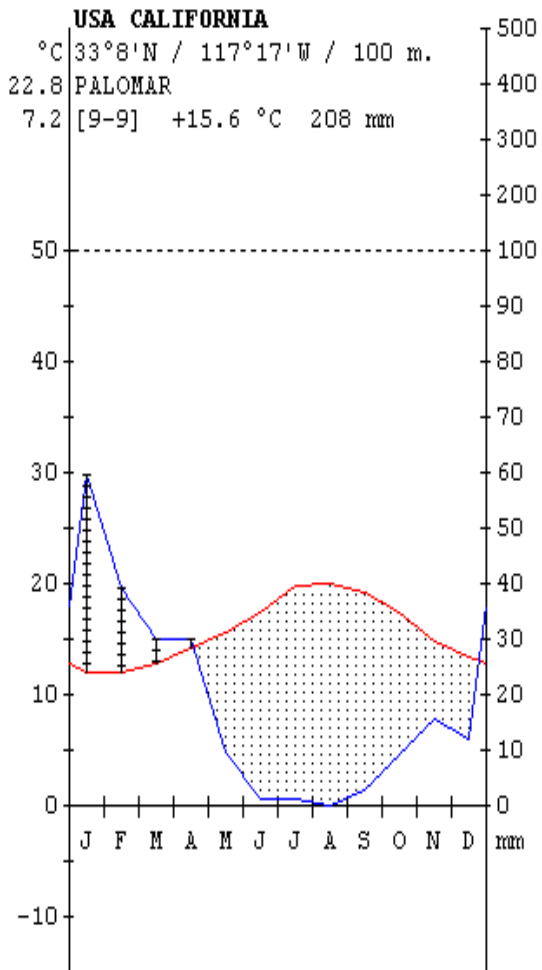
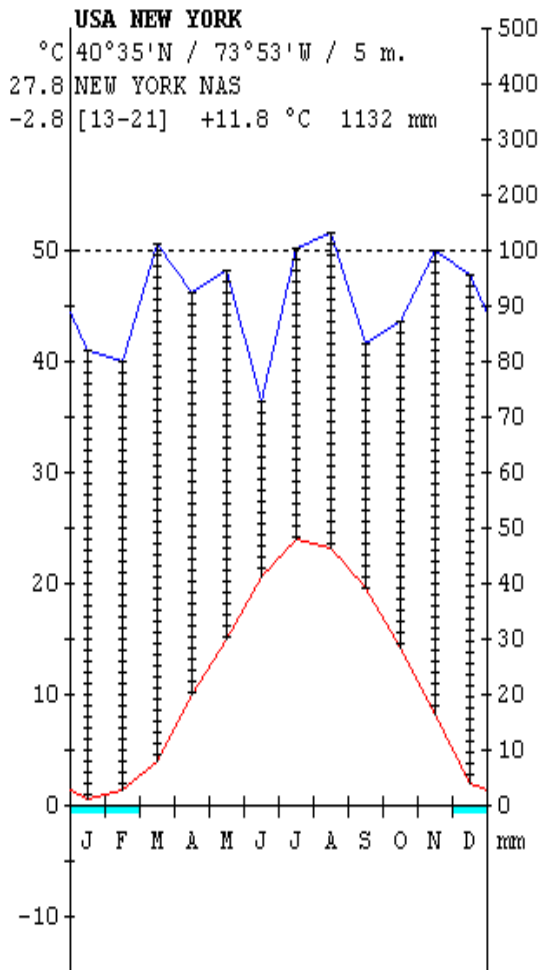


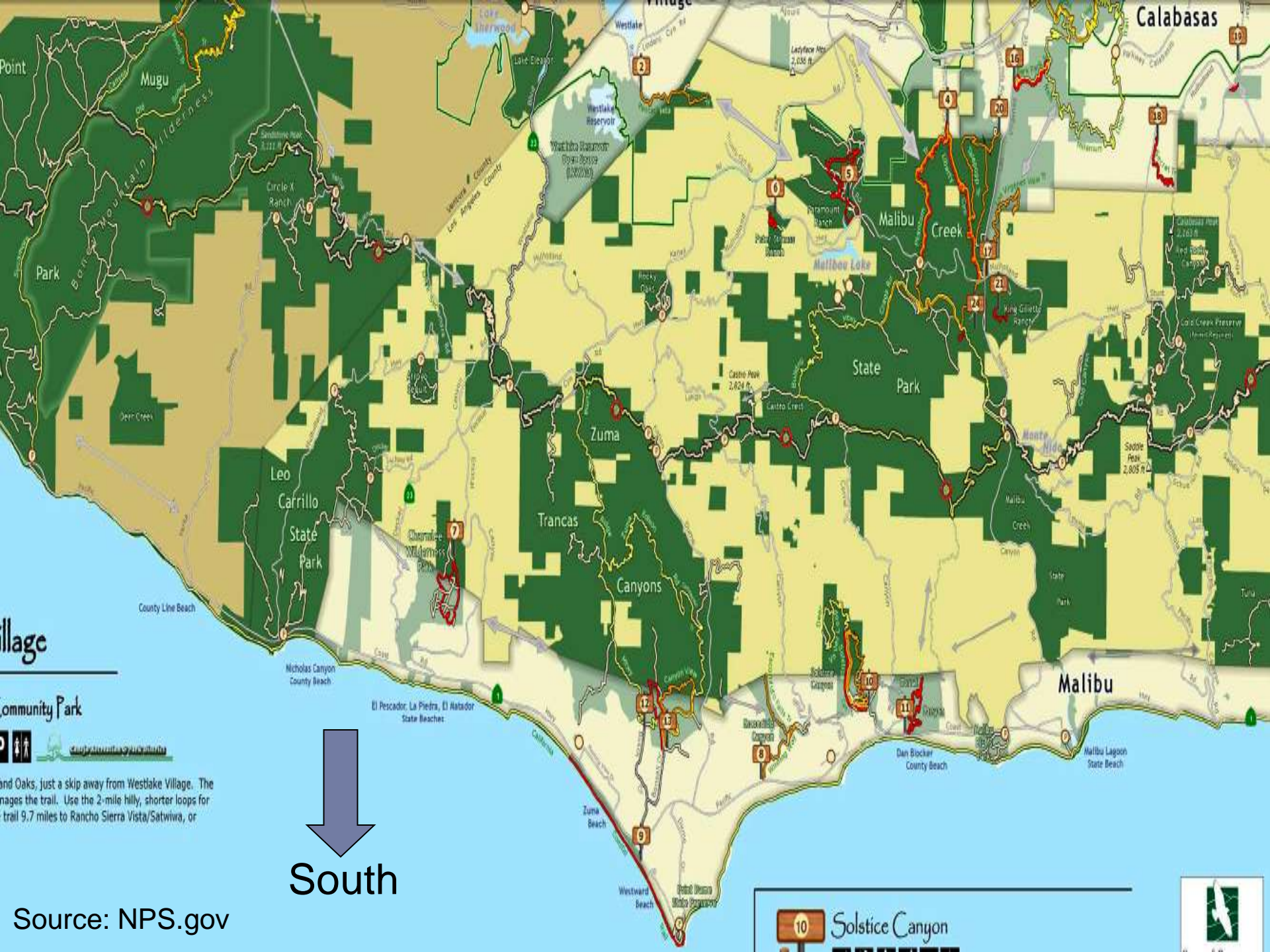
Cool, Moist Winters, Warm Dry Summers

- Relatively low seasonal variation in temperature
- Moderating effect of cold offshore currents
- Relatively few freezes
- Rainfall concentrated in winter: 10 – 40 in.
- Highly variable from year to year
- Summer rains are uncommon



Cool, Moist Winters, Warm Dry Summers





Calabasas

South

Source: NPS.gov

10 Solstice Canyon



Santa Monica Mountains

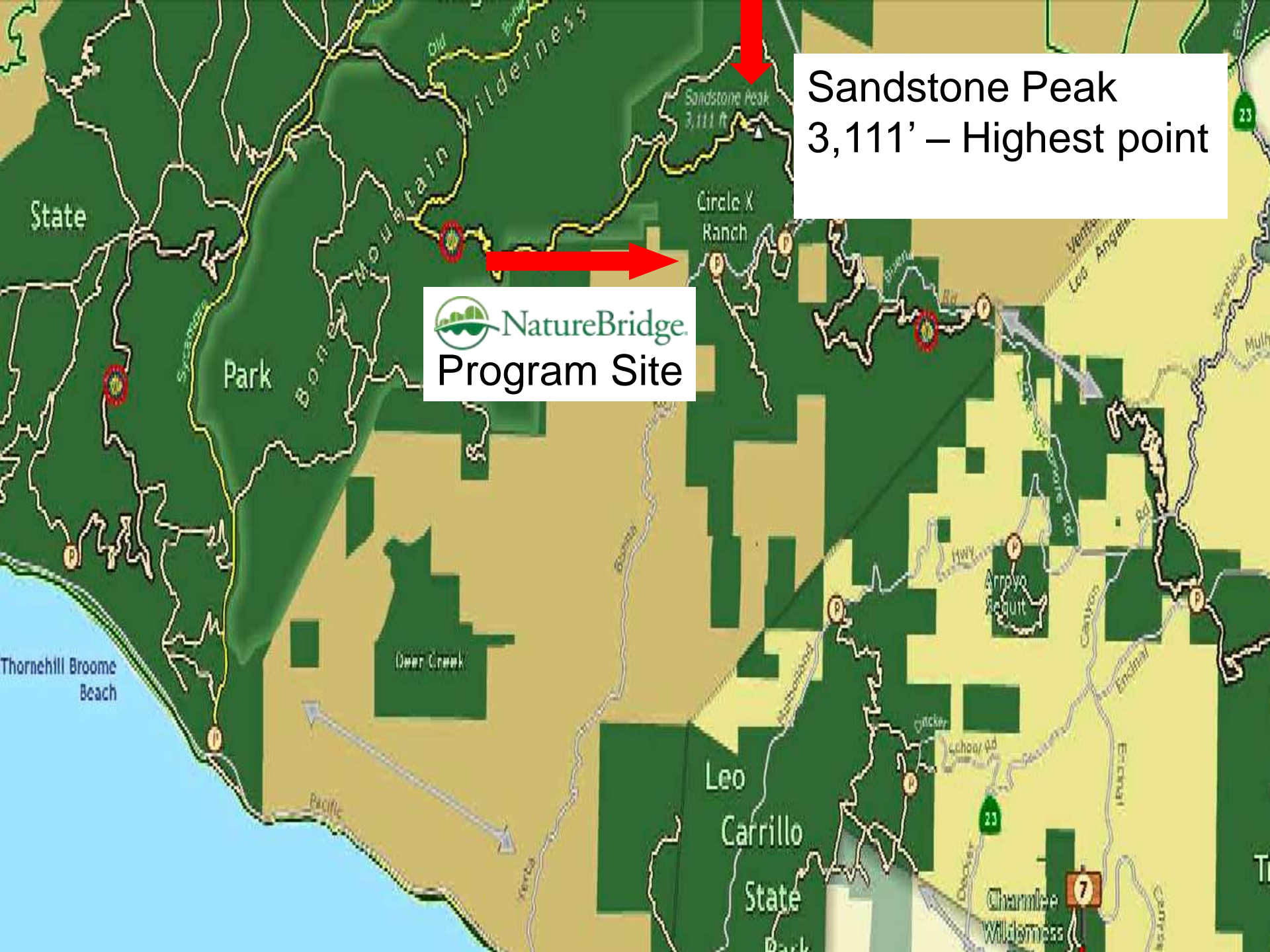
- Transverse range
- Mediterranean climate (California)
- 1.5 hours to large metro Los Angeles
- Climate related relationships:
 - Seed germination (frost, fire)
 - Wildfire frequency
 - Vegetation patterns (light, heat, water loss)
 - Phenological cycles (flowers, insects, animals)

Santa Monica Mountains


Is this true in microenvironments?

- In winter, temperatures rarely drop below 5°C (41°F) and are more likely to be in the region of 12° to 13°C (53° to 55°F) while in summer averages can be up to 27°C (80°F).
- Frosts are very rare in a Mediterranean climate although when they do occur they can cause great damage to crops. For this reason, vulnerable crops such as citrus fruits are usually planted on sloping terrain rather than in valley floors, where in a cold spell frosts are likely to occur as cold air collects in the valley bottom.

Source: BBC Weather



Sandstone Peak
3,111' – Highest point

 NatureBridge
Program Site

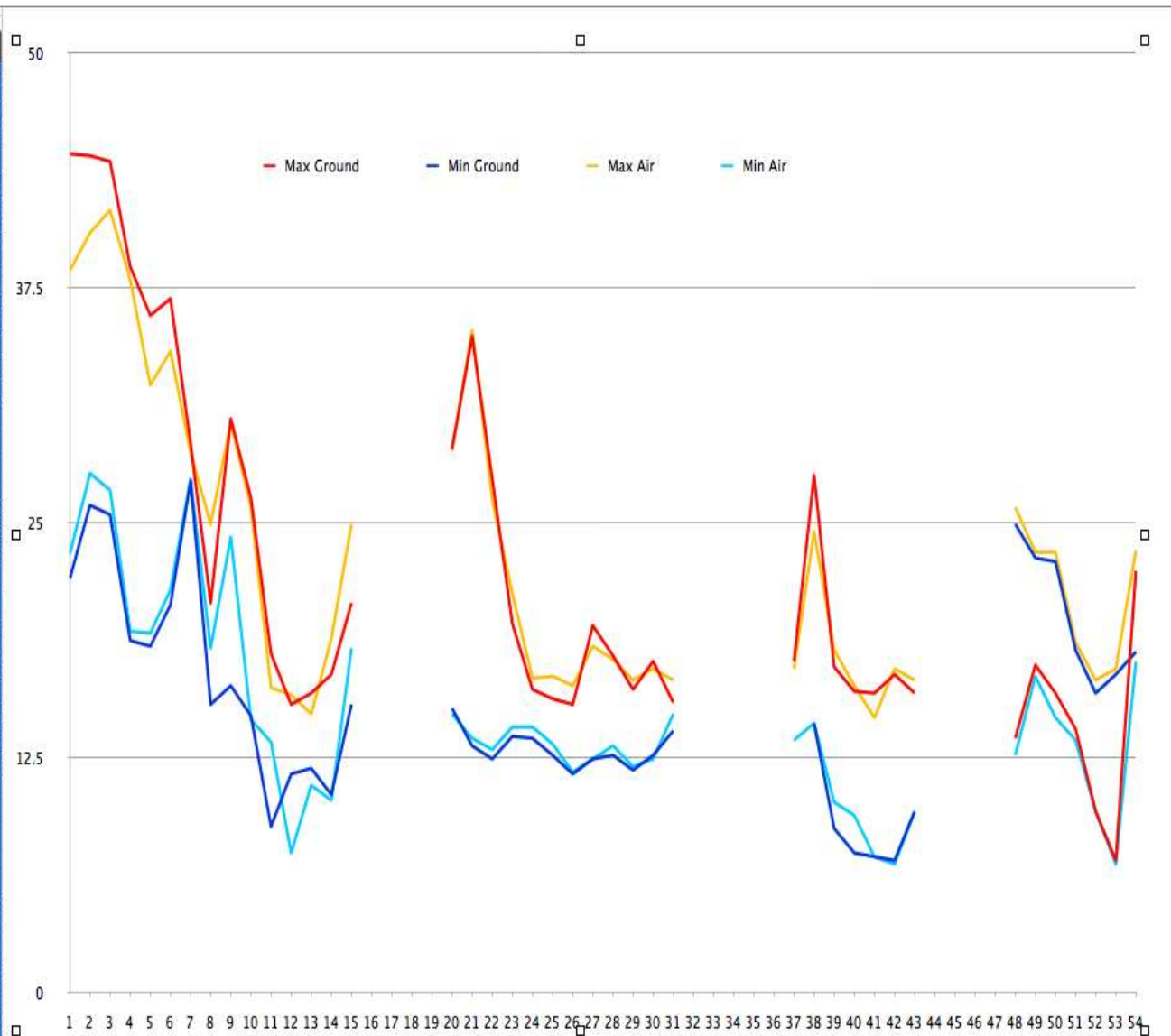
Method

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

- Place Max/Min thermometers that log ground and air temperature for a week at specific sites that students frequent.
- Record on weekly hikes.

Method

Date	Night		Day	
	Temp Max	Temp Min	Temp Max	Temp Min
24-Sep	44.6	22	38.4	23.3
25-Sep	44.5	25.9	40.4	27.6
26-Sep	44.2	25.4	41.6	26.7
27-Sep	38.6	18.7	37.9	19.2
28-Sep	36	18.4	32.3	19.1
29-Sep	36.9	20.6	34.1	21.4
30-Sep	29.2	27.2	28.7	27.3
1-Oct	20.7	15.3	24.9	18.3
2-Oct	30.5	16.3	30.3	24.2
3-Oct	26.3	14.7	25.8	14.5
4-Oct	18	8.8	16.2	13.3
5-Oct	15.3	11.6	15.8	7.4
6-Oct	15.9	11.9	14.8	11
7-Oct	16.9	10.5	18.8	10.2
8-Oct	20.7	15.3	24.9	18.3
9-Oct				
10-Oct				
11-Oct				
12-Oct				
13-Oct	28.9	15.1	28.8	14.8
14-Oct	34.9	13.1	35.2	13.5
15-Oct	27.3	12.4	26.2	12.9
16-Oct	19.6	13.6	21.2	14.1
17-Oct	16.1	13.5	16.7	14.1
18-Oct	15.6	12.6	16.8	13.2
19-Oct	15.3	11.6	16.3	11.7
20-Oct	19.5	12.4	18.4	12.4
21-Oct	17.9	12.6	17.7	13.1
22-Oct	16.1	11.8	16.6	12
23-Oct	17.6	12.6	17.2	12.4
24-Oct	15.4	13.9	16.6	14.8
25-Oct				
26-Oct				
27-Oct				
28-Oct				
29-Oct				
30-Oct	17.6		17.2	13.4
31-Oct	27.5	14.3	24.5	14.3
1-Nov	17.3	8.7	18.2	10.1
2-Nov	16	7.4	16.3	9.4
3-Nov	15.9	7.2	14.6	7.2
4-Nov	16.9	7	17.2	6.8
5-Nov	15.9	9.6	16.6	9.6
6-Nov				
7-Nov				
7-Nov				



Method

- Time lapse photography with field cameras.
- Record phenological changes associated with temperature variation.
- Animal trail cameras to capture large animals.
- cameras focused on flowering plants to record insect pollinators and compare them to temperature data.

QuickTime™ and a
TIFF (Uncompressed) decompressor
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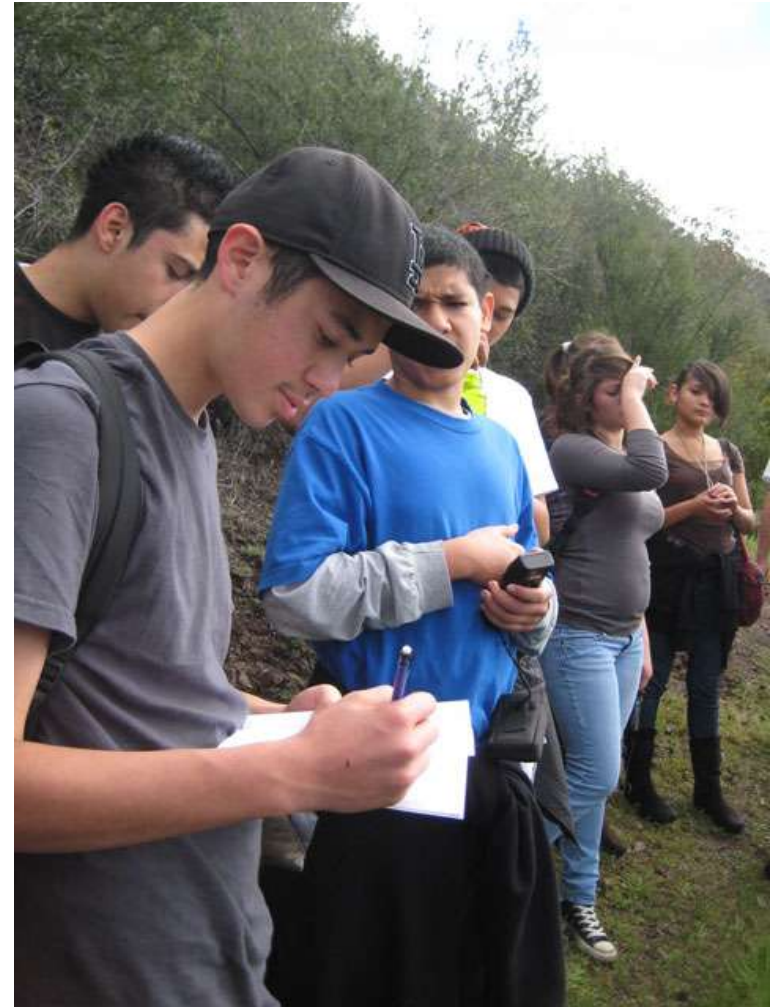
Education Value

- Simple
- Directly related to their physical experience in the park
- Gain a greater “Sense of Place”
- Learn the value of teamwork to conduct an Investigation and the value of data collection as a form of stewardship
- Springboard to climate change discussions
- Introduction to analysis and graphing of data
- Visuals can be placed on website for students



Science Value

- Ongoing research on seed viability and freezing episodes at ground level in microenvironments
- Constant source of data in remote sites not studied at present and not available to scientists
- Can be duplicated in other Mediterranean regions statewide or worldwide
- Easy to visual and analyze data



NatureBridge Programs in Santa Monica

- Weekly visits by students to sites
- Hiking to remote areas
- Spending 4-8 hours on trail
- Science and climate change emphasis
- Comparison of natural landscape to urban landscape
- Serving large underserved population from LAUSD



Potential Implementation Issues

- Equipment placement in park
- Access to equipment from trails
- Constant visits from students without gap in data collection
- Fit into curricular plan for each group

NatureBridge-Wide Data Collection

Possible Extension of Data Collection and Comparison with Other NatureBridge Campuses

Mediterranean climate:

Marin Headlands (San Francisco)

Yosemite (Sierra Nevada)

Temperate rain forest climate:

Olympic Park Institute (Washington)

Extensions for Future Data

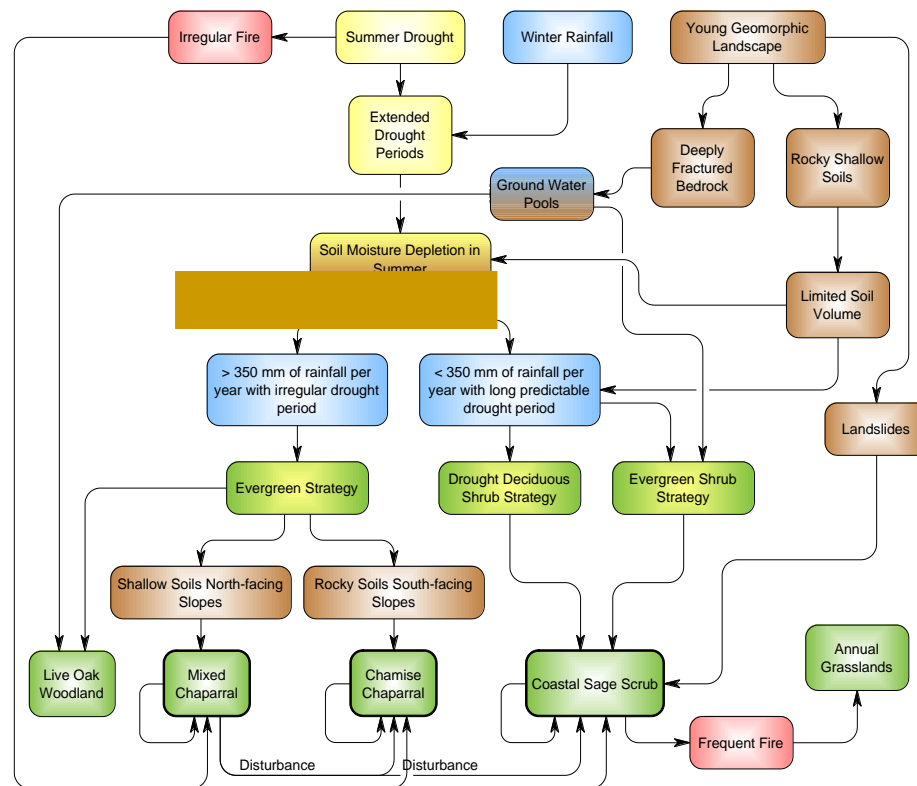
Biome - a regional ecosystem characterized by distinct types of vegetation, animals, and microbes that has developed under specific **soil** and **climatic conditions**.

Other Possible Study: Comparison of Insolation or Aerosols in Los Angeles Metro and at the Top of Sandstone Peak

Multiple Determinants

Regional: Geology, Soil, Aspect, Weather

Chaparral & Coastal Sage Scrub



Multiple Determinants

Should we worry about Mediterranean biomes?

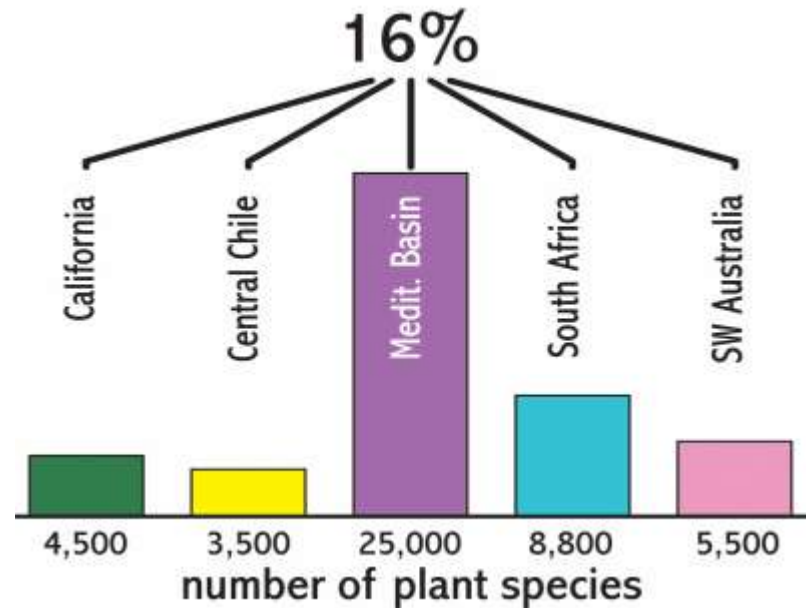
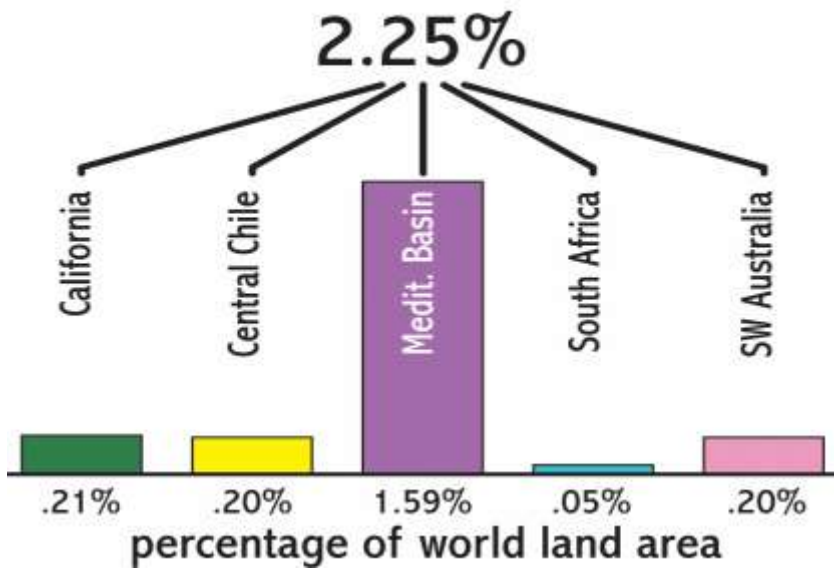
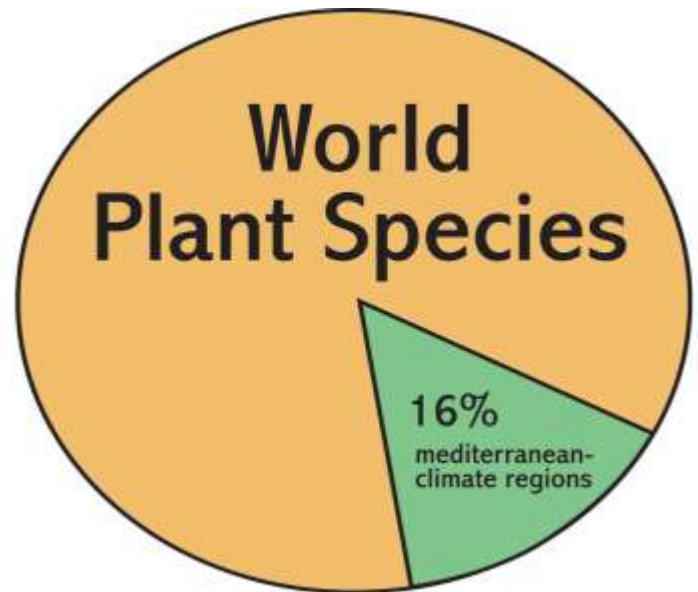
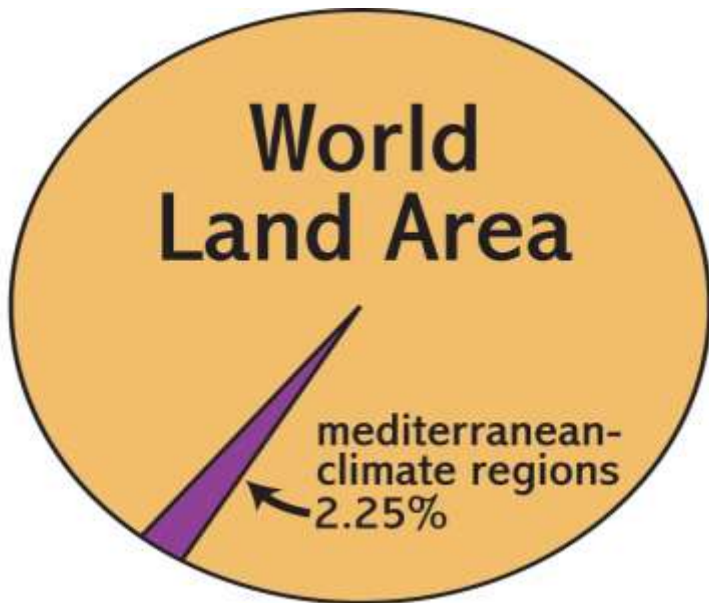
- More than 41% of land has been converted to farmland and urban uses. Worldwide, only 5% of natural areas are protected.
- In tropical rainforests habitat loss exceeds habitat protection by 2 to 1 (for every acre of rainforest saved, two have been lost to conversion or development). In Mediterranean habitats loss exceeds protection by 8 to 1.

Source: Nature Conservancy 2007

Multiple Determinants

Abstract example from previous research

The high plant diversity of Mediterranean-climate regions has attracted much attention over the past few years. This review discusses patterns and determinants of local, differential and regional plant diversity in all five regions. Local diversity shows great variation within and between regions and explanations for these patterns invoke a wide range of hypotheses. Patterns of regional diversity are the result of differential speciation and extinction rates during the Quaternary. **These rates have been influenced more by the incidence of fire and the severity of climate change than by environmental heterogeneity.** All regions have a high number of rare and locally endemic taxa that survive as small populations, many of which are threatened by habitat transformation.



Multiple Determinants

Why are Mediterranean Biomes so diverse?

- Climate (latitude?)
- Geology
- Varied soils (micronutrients, serpentines)
- Complex topography (slope, aspect, elevation)
- Fire ecology
- High degree of natural hybridization



SANTA MONICA MTNS (S CAL)

Asteraceae - 107

Fabaceae - 46

Poaceae 44

Scrophulariaceae - 33

Cyperaceae - 23



STIRLING RANGE (SW AUS)

Myrtaceae – 160

Proteaceae - 144

Fabaceae - 141

Orchidaceae - 123

Asteraceae - 92

Source: Rundel 2007

Multiple Determinants

- Multiple determinants influence the growth of any particular plant in any given location.
- Influences occur at several scales and interactions are complex.

Multiple Determinants

Macro-Scale:
Climate (Rainfall & Temp)

