Nov 9: Plants, Animals, and Ecosystems in Different Climate Zones

Quiz 3

- Köppen Climate Zones
- Vegetation characteristics
- Unique plants and animals

Köppen Climate Zones — Land Area Coverage

Köppen Zone	Description	% of Land Area	Approx. Million km^2
A – Tropical	Rainforest, monsoon, savanna (hot & wet)	~20%	~29 million km^2
B – Dry (Arid & Semi-arid)	Deserts, steppes (hot or cold, dry)	~26%	~38 million km^2
C – Temperate (Mesothermal)	Mild winters, warm summers (Mediterranean, subtropical)	~20%	~29 million km^2
D – Continental (Microthermal)	Cold winters, warm summers (humid continental, subarctic)	~21%	~31 million km^2
E – Polar	Tundra, ice cap (very cold, dry)	~13%	~19 million km^2
Highlands (H)	Mountains (varies with altitude, small patches globally)	~2–3%	~4 million km^2

A - Tropical Climates

Moist tropical climates extend north and south from the equator to about 15° to 25° latitude. In these climates, all months have **average temperatures** greater than 64°F (18°C) and **annual precipitation** greater than 59".


Brisbane, Australia (2022)


Amazon River, Peru (2023)

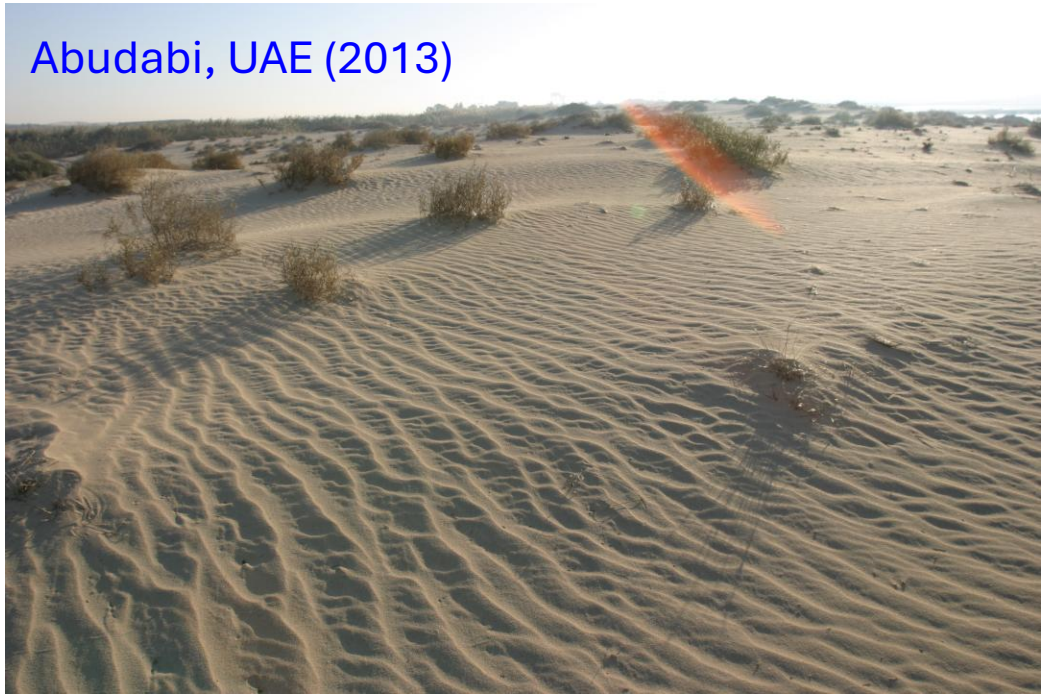

Masai Mara National Park, Kenya (2023)

B - Dry Climates

The most obvious climatic feature of this climate is that potential evaporation and transpiration exceed precipitation; in other words, they are very dry. These climates extend from 20°-35° North and South of the equator and in large continental regions of the mid-latitudes, often surrounded by mountains.


Aral Sea, Kazakhstan (2022)


East Mongolia (2018)


Abudabi, UAE (2013)

C - Moist Subtropical Mid-Latitude Climates

This climate generally has warm and humid summers with mild winters. It extends from 30°-50° latitude mainly on the eastern and western borders of most continents. During the winter, the main weather feature is the mid-latitude cyclone. Convective thunderstorms dominate summer months.


Evergreen Forest, Taiwan (2009)


Urban forests, Bagan, Myanmar (2015)

D - Moist Continental Mid-Latitude Climates

Moist continental mid-latitude climates have warm to cool summers and cold winters. The location of these climates is poleward of the **"C"** climates. The average temperature of the warmest month is greater than 50°F (10°C), while the coldest month average temperature is less than 27°F (-3°C). Winters are severe, with snowstorms, strong winds, and bitter cold from Continental Polar or Arctic air masses.


Deciduous forest, Lake Lansing (2023)


Scotch Pine forest, Sweden (2024)

E - Polar Climates

Polar climates have year-round cold temperatures, with the warmest month less than 50°F (10°C). Polar climates are found on the northern coastal areas of North America, Europe, Asia, and on the land masses of Greenland and Antarctica.

Antarctica is an example of a polar climate

(https://www.worldatlas.com/articles/what-are-the-features-of-a-polar-climate.html)



H – Highlands

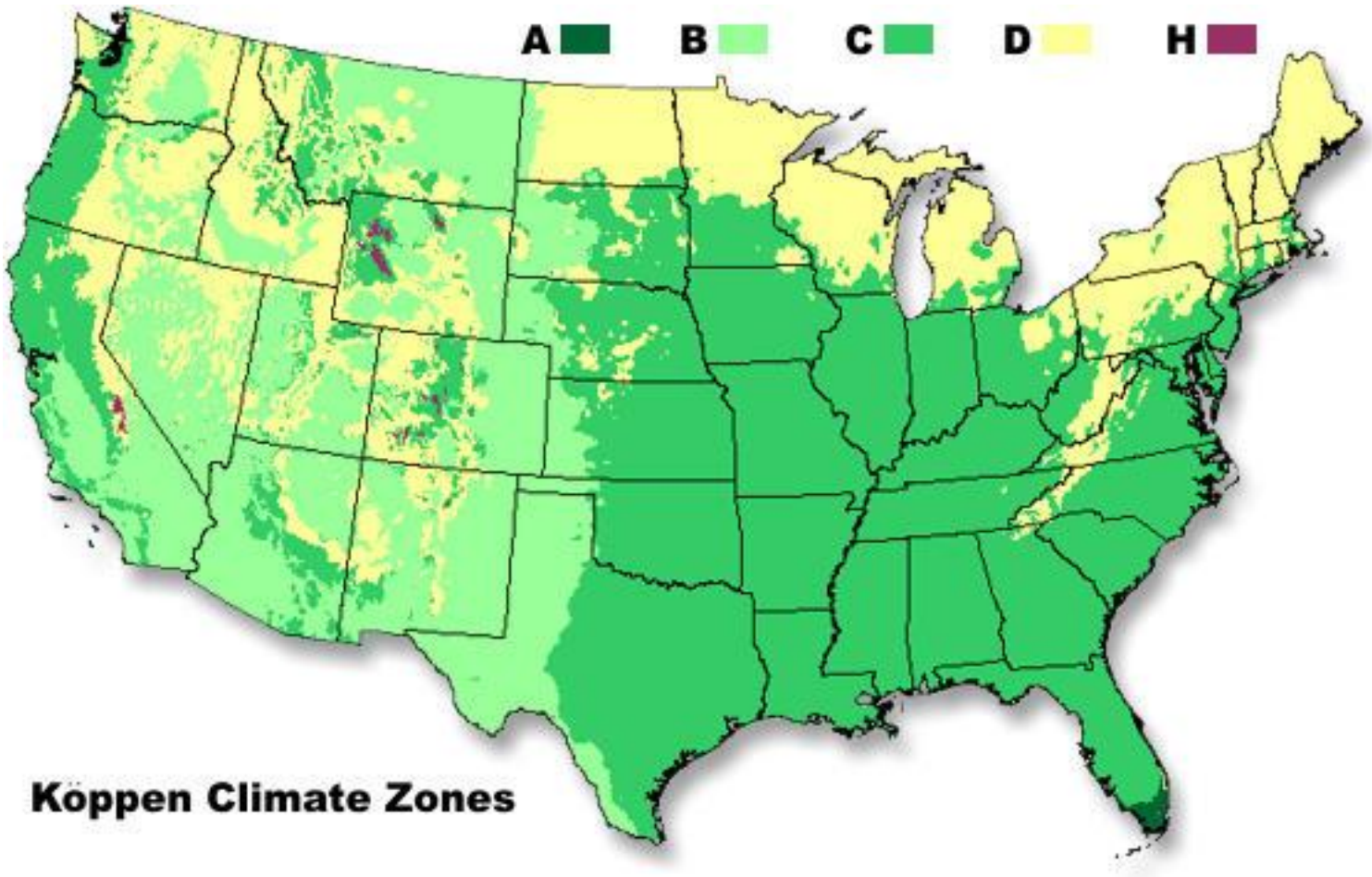
Unique climates that are a result of elevation. Highland climates occur in mountainous terrain where rapid elevation changes cause rapid climatic changes over short distances.







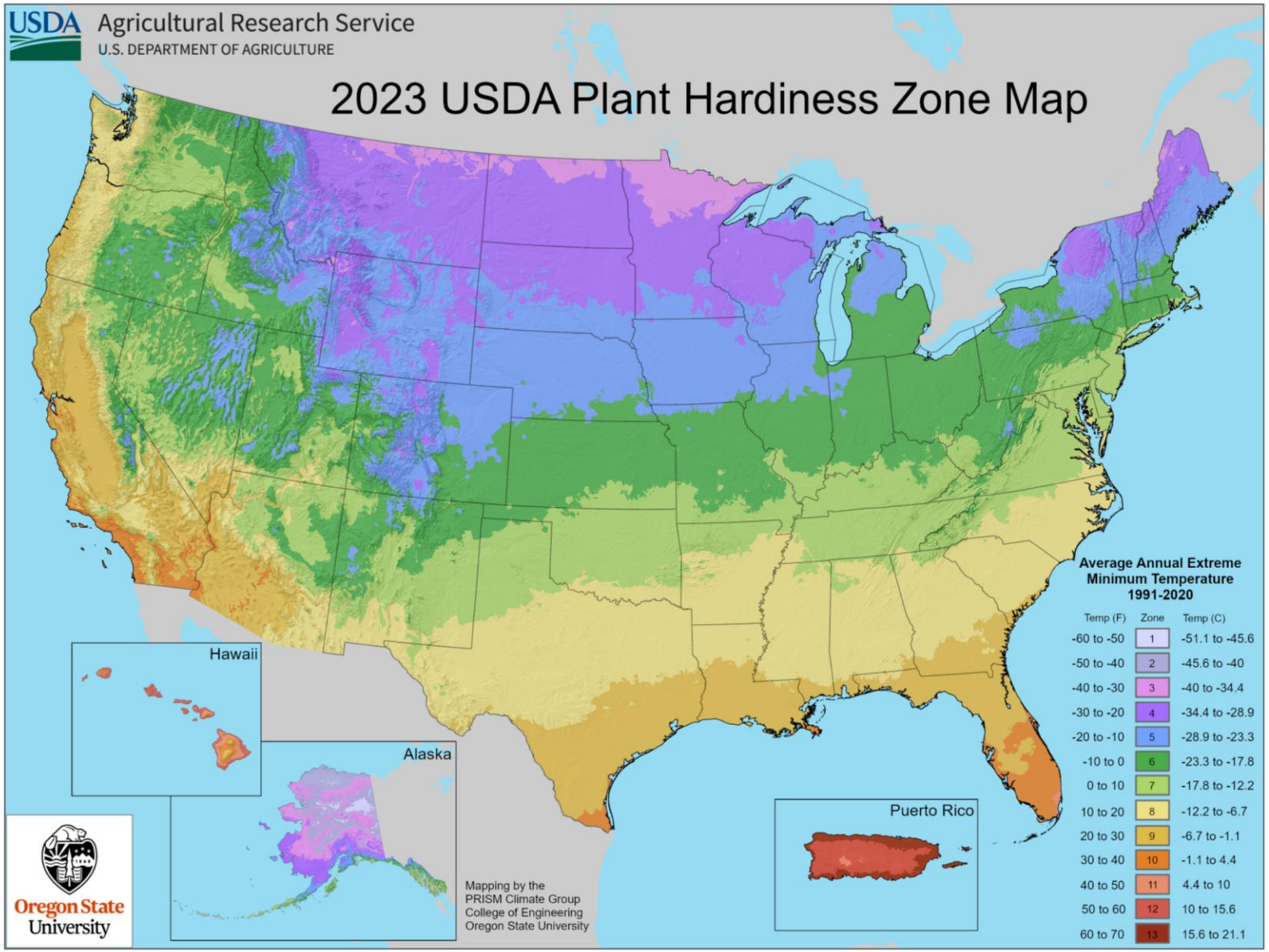
Source: https://www.noaa.gov/jetstream/global/climate-zones



The major Köppen zones in the U.S. The extra climate zone, labeled "H" on this map, is a special zone called the highlands. The highlands climate zone is characterized by weather that differs from the surrounding area because of mountains. Credit: NOAA (modified)

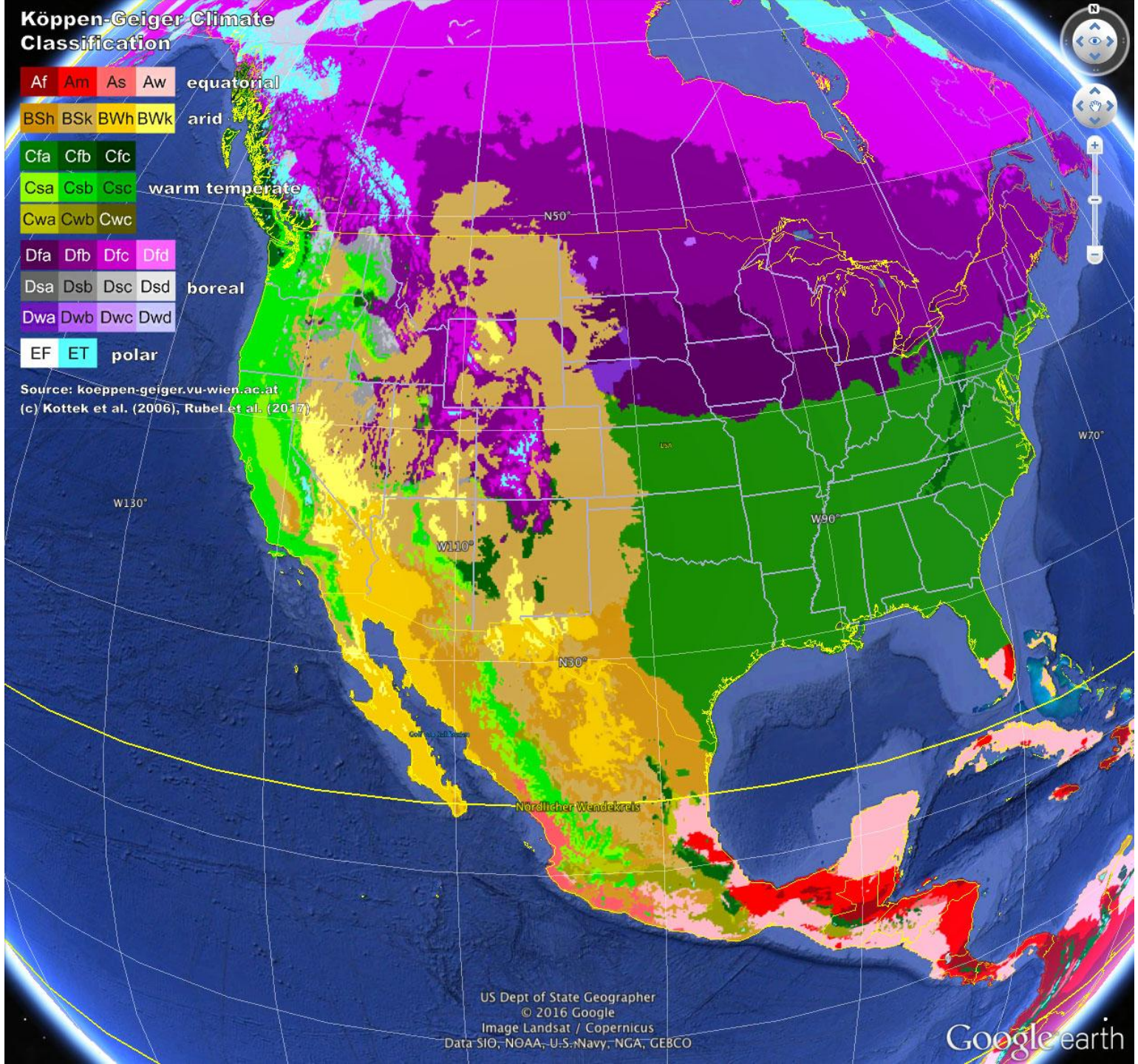
The USDA Plant Hardiness Zone Map is the standard by which gardeners and growers can determine which perennial plants are most likely to thrive at a location. The map is based on the average annual extreme minimum winter temperature, displayed as 10 °F zones and 5 °F half zones.

https://planthardiness.ars.usda.gov/

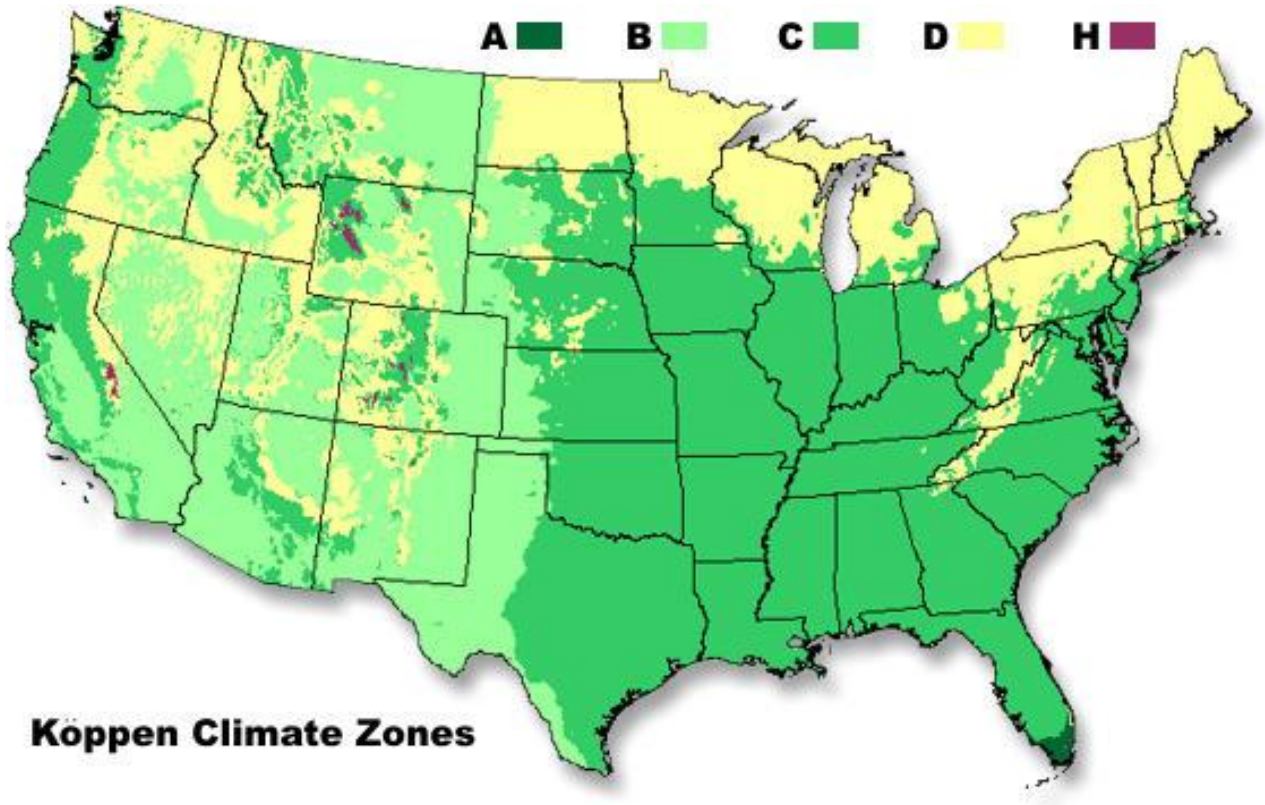


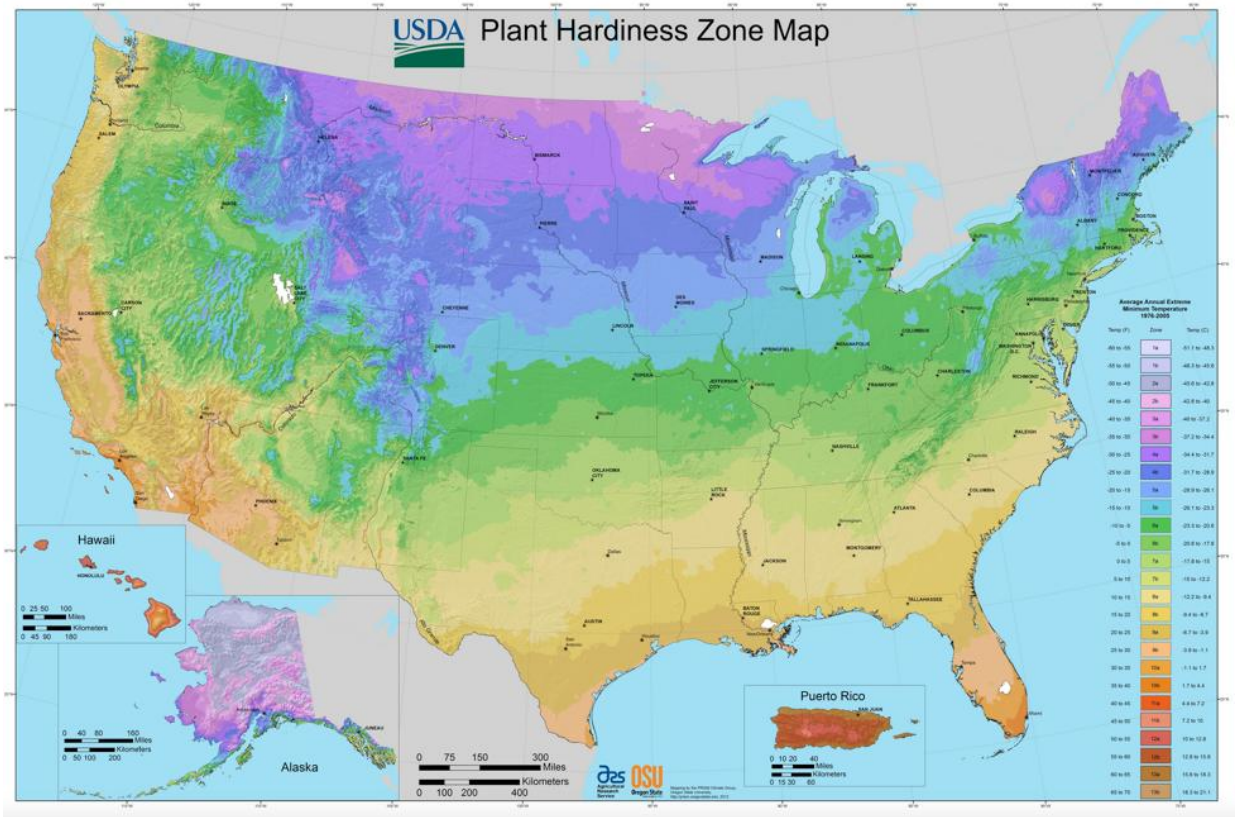
The re-analyzed Köppen-Geiger map is provided with the higher resolution of 5 arc minutes using the downscaling algorithms described by Rubel et al. (2017).

https://koeppen-geiger.vu-wien.ac.at/present.htm

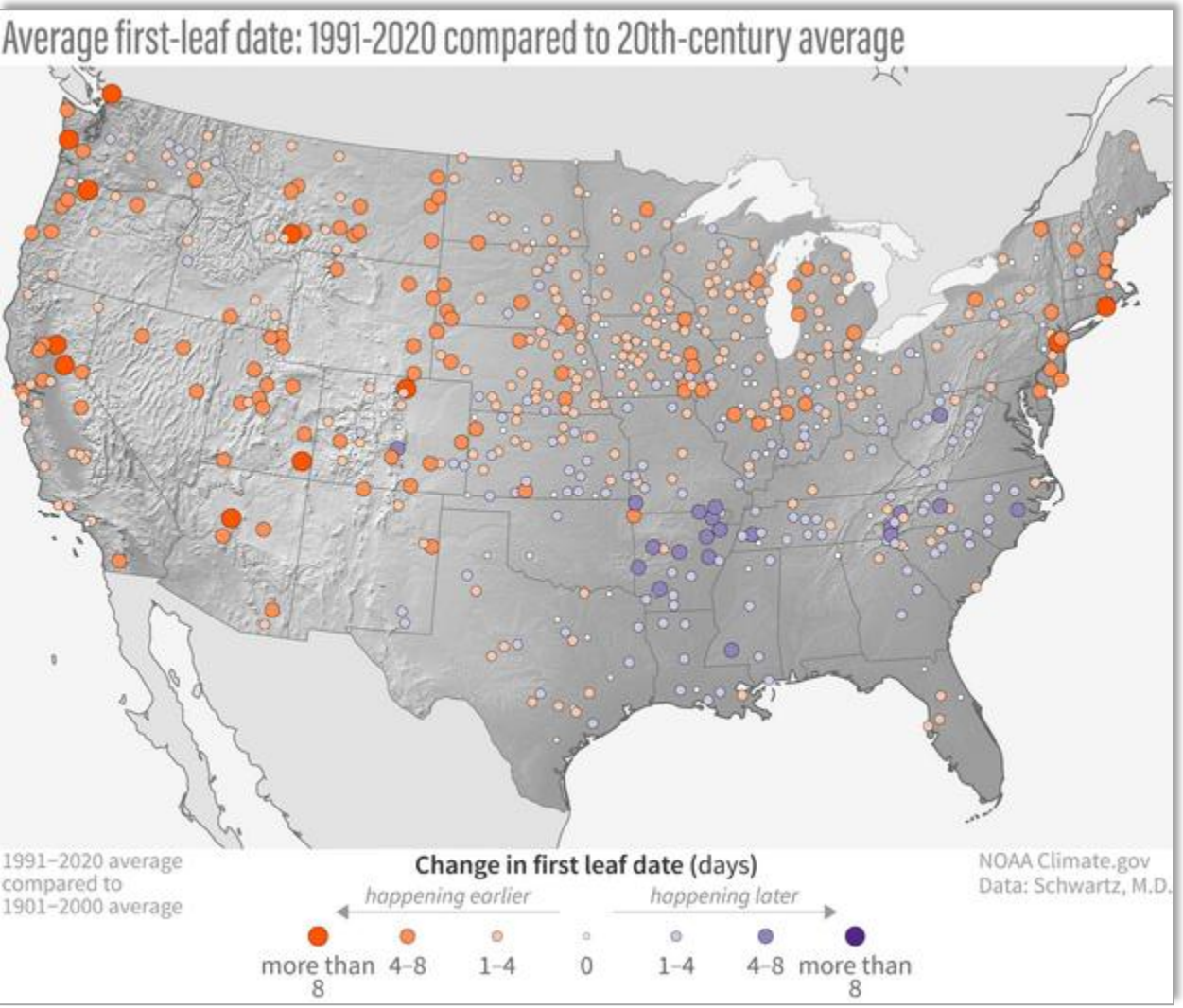


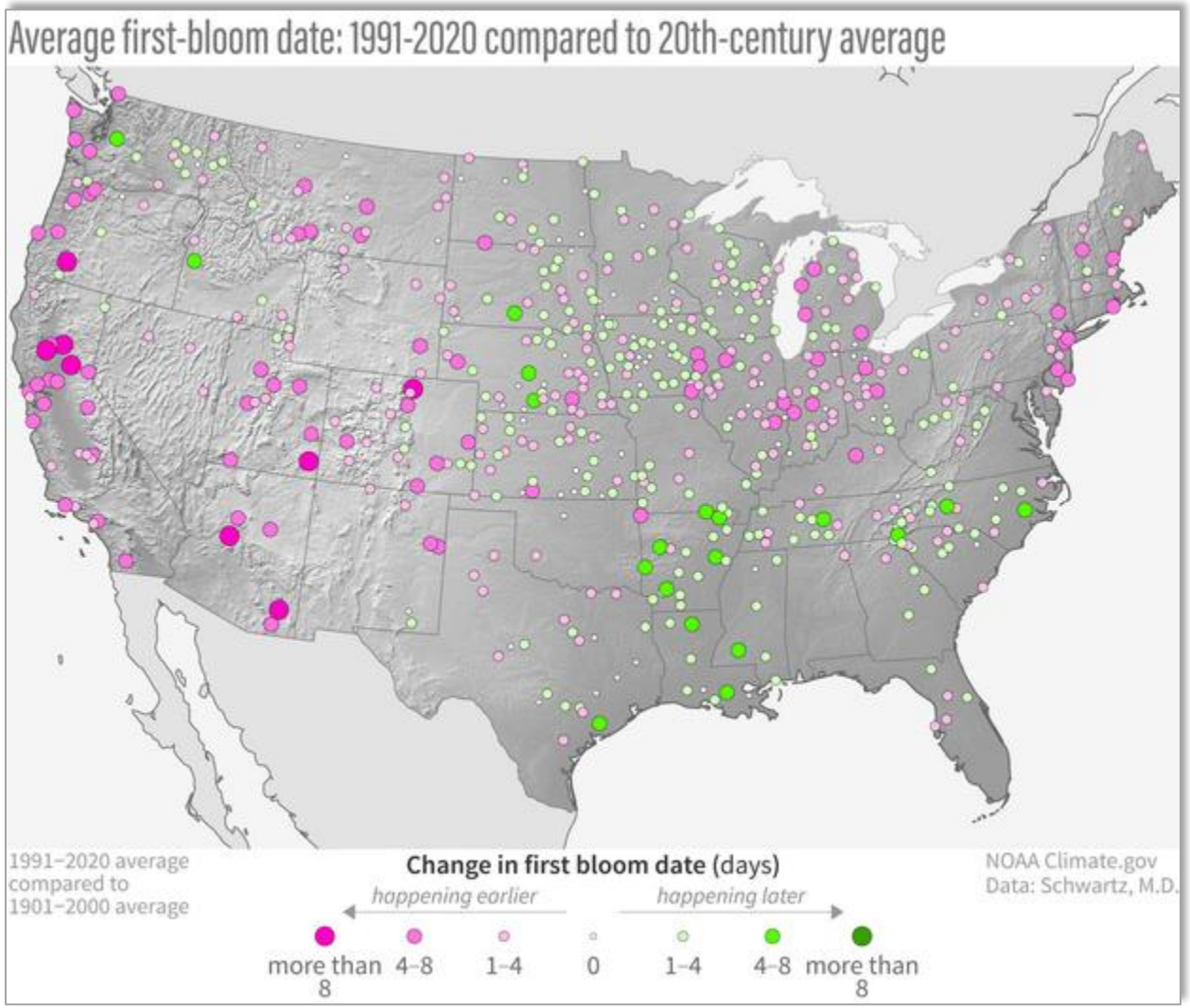
Differences





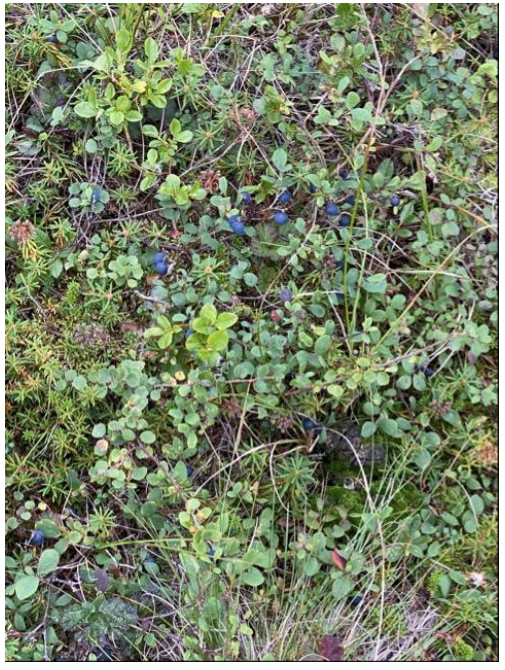
Other types of Climate Maps: https://www.climate.gov/news-features





Vegetation in Different Climate Zones





Quinn Raleigh, berry plants Nome Alaska 2024



Vegetation in Different Climate Zones



Quinn Raleigh, Just north of Nome Alaska 2025



Quinn Raleigh, Nome/Solomon Alaska 2024

Vegetation in Different Climate Zones





Vegetation in Different Climate Zones



Quinn Raleigh, Nome/Solomon 2024 Last Train to Nowhere



Quinn Raleigh, Unalakleet Alaska 2023

Vegetation in Different Climate Zones



Taiwan, 2009, J. Chen

Vegetation in Different

Western Desert, Egypt, 2003



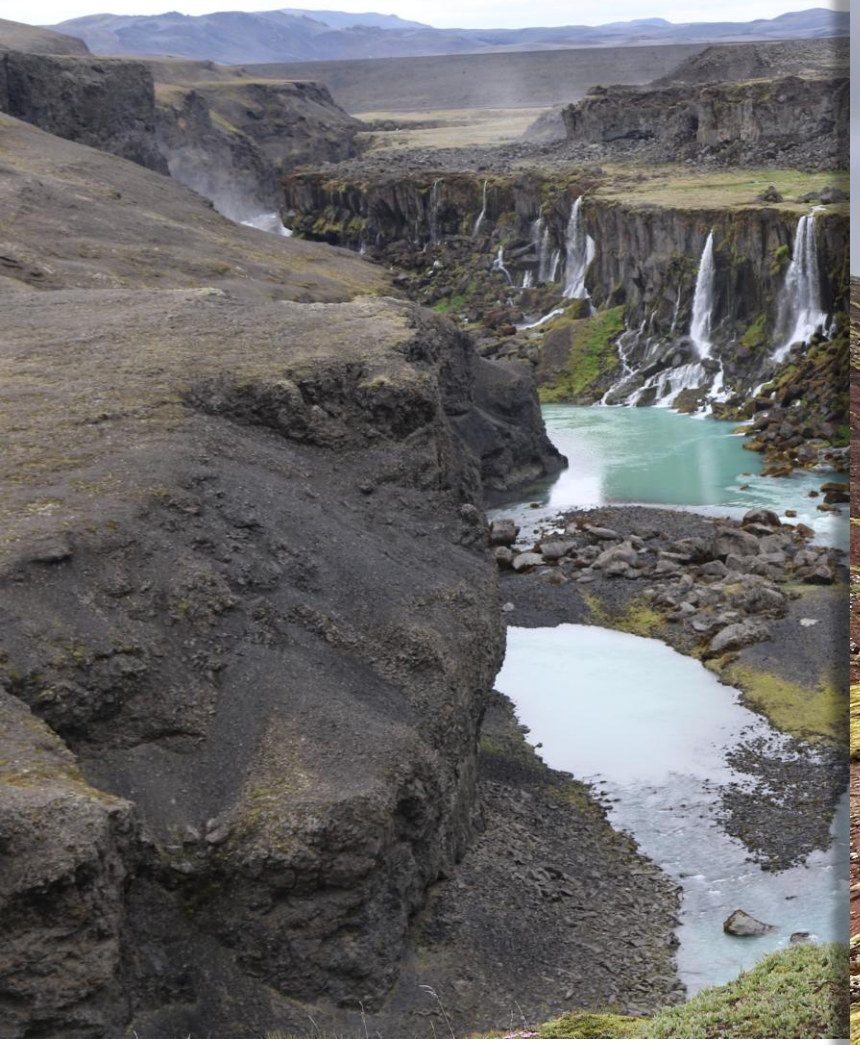


Vegetation in Different Climate Z



Vegetation in Different Climate Zones

Iceland, 2024; J. Chen



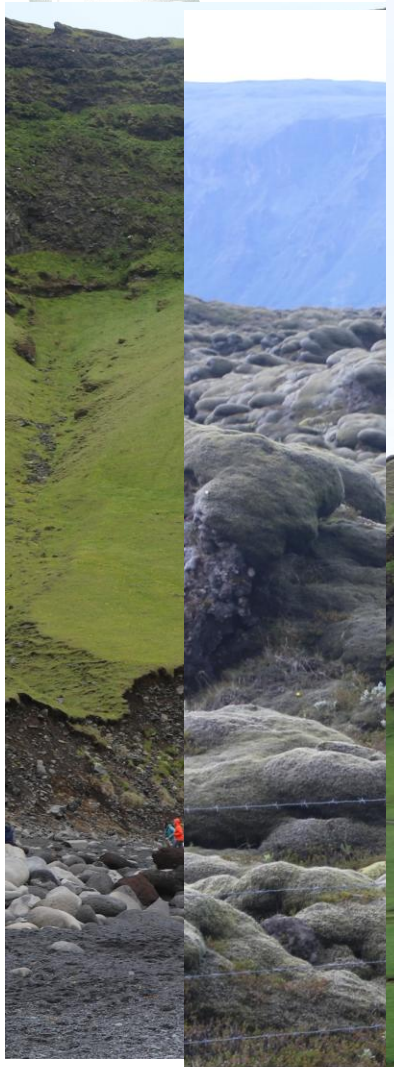


Vegetation in Different Climate Zones



Iceland, 2024; J. Chen

Vegetation in



Iceland, 2024; J. Chen

Take-home-messages

1) Five major climate zones in Köppen Climate Classification
2) Three criteria for the classification:
3) Uncertainty (e.g., station distribution, resolution, landscape complexity, etc.)
4) User dependent
5) Contrasting vegetation: characteristics

Nov 11: Paleoclimate Reconstructions (Guest Lecture by Dr. Nathan Moore)