

# Non-flowering Plants



FOSS Diversity of Life



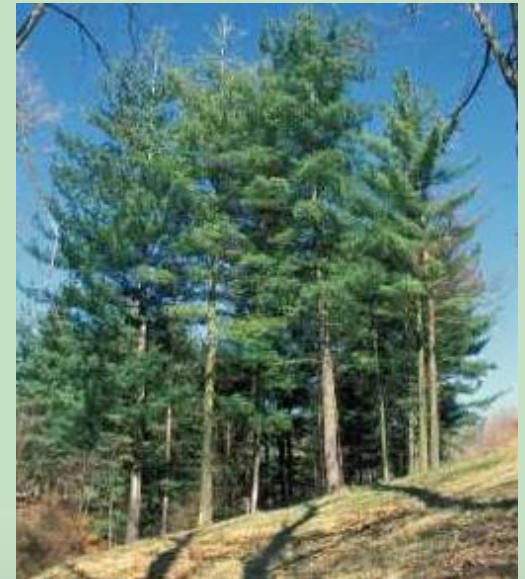
# What are some plants that don't have flowers?



ferns



pine trees



mosses



# Spore-producing Plants



☞ Mosses and Ferns use **spores** to reproduce instead of seeds.



Spore cases growing up from a moss



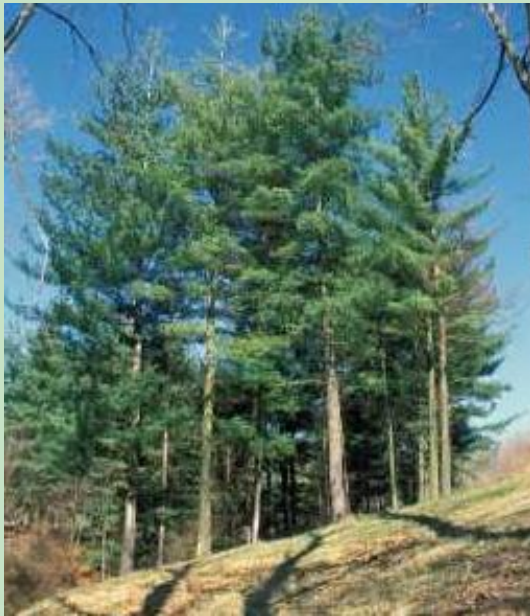
Spore cases on the back of a fern



# Gymnosperms



☞ Pine trees, fir trees, redwoods, sequoias and ginkgos are all **gymnosperms**.  
They form seeds...



White pine



White fir



Giant sequoia

# Gymnosperms



- œ Fertilization happens in **cones**, not flowers.



- œ Gymnosperms have seeds and cones, but don't have fruit.
- œ Angiosperms have seeds, flowers, and fruit.

# Vegetative Reproduction



☞ Sometimes plants simply grow from an already existing plant.



Potato



English ivy

# Evolutionary History



450 million years ago – First land plants appeared. They were very simple and used spores to reproduce. They needed water to spread their spores.

hornwort

Credit: UCMP, Berkeley





# Evolutionary History



350 million years ago –  
Ferns dominate dry land.

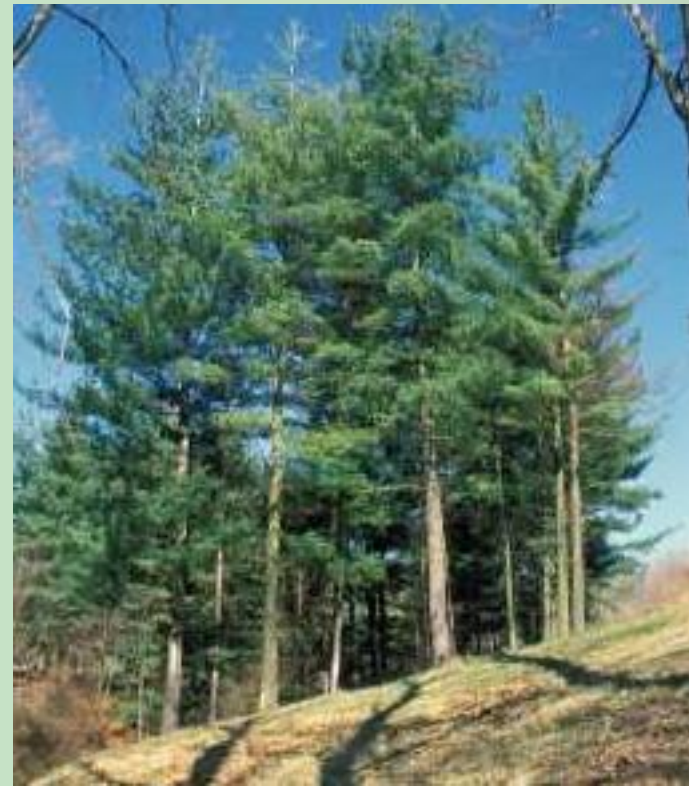




# Evolutionary History



300 million years ago – The first seed-bearing plants (gymnosperms) appear. Seeds are an **adaptation** that allow these plants to spread to dryer areas.



# Evolutionary History



✧ >135 million years ago –  
Angiosperms develop  
and are now the most  
diverse kind of plant  
found on Earth. There  
are more kinds of  
flowering plants than  
any other kind of plant.



How did flowering plants become so successful?