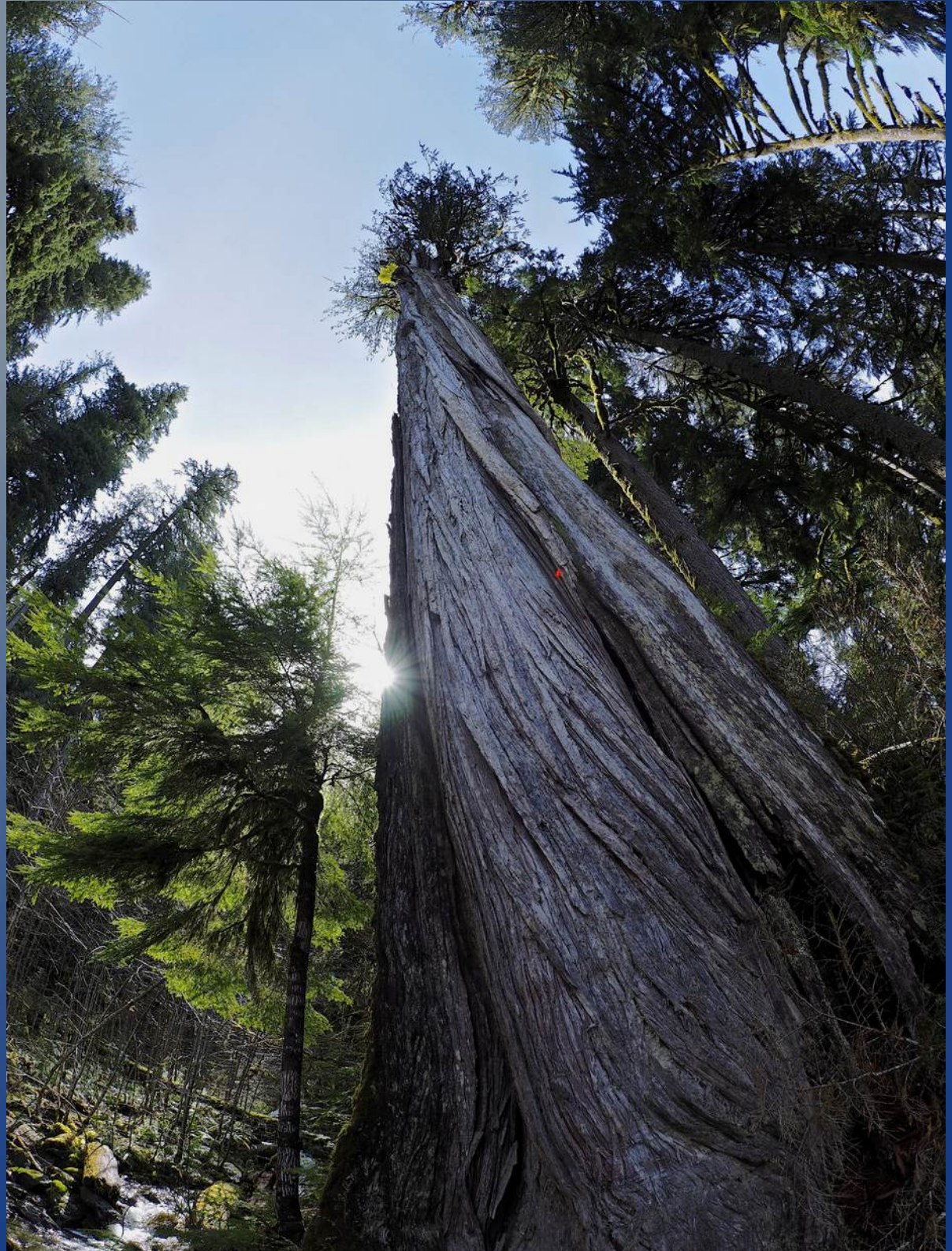
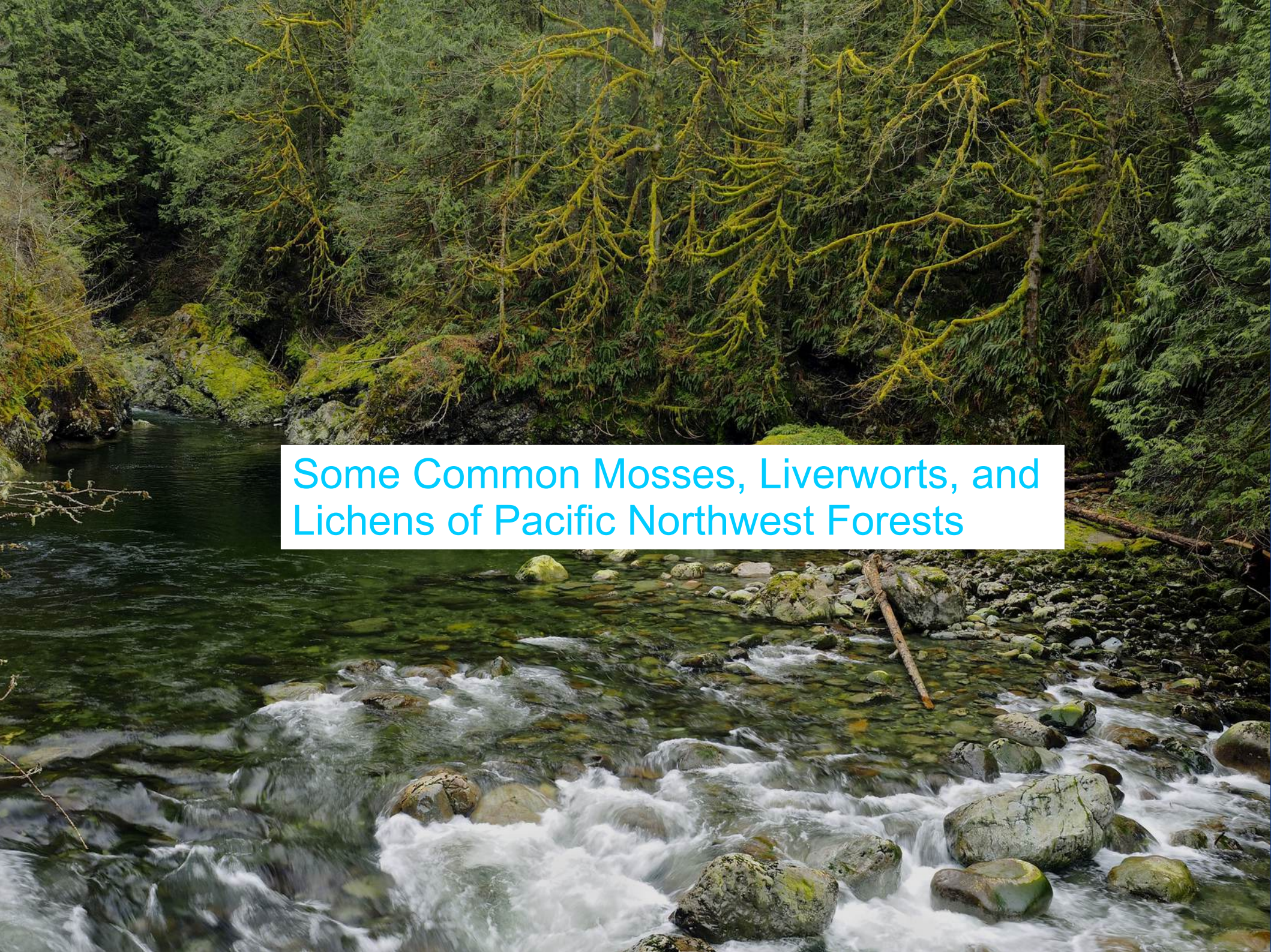
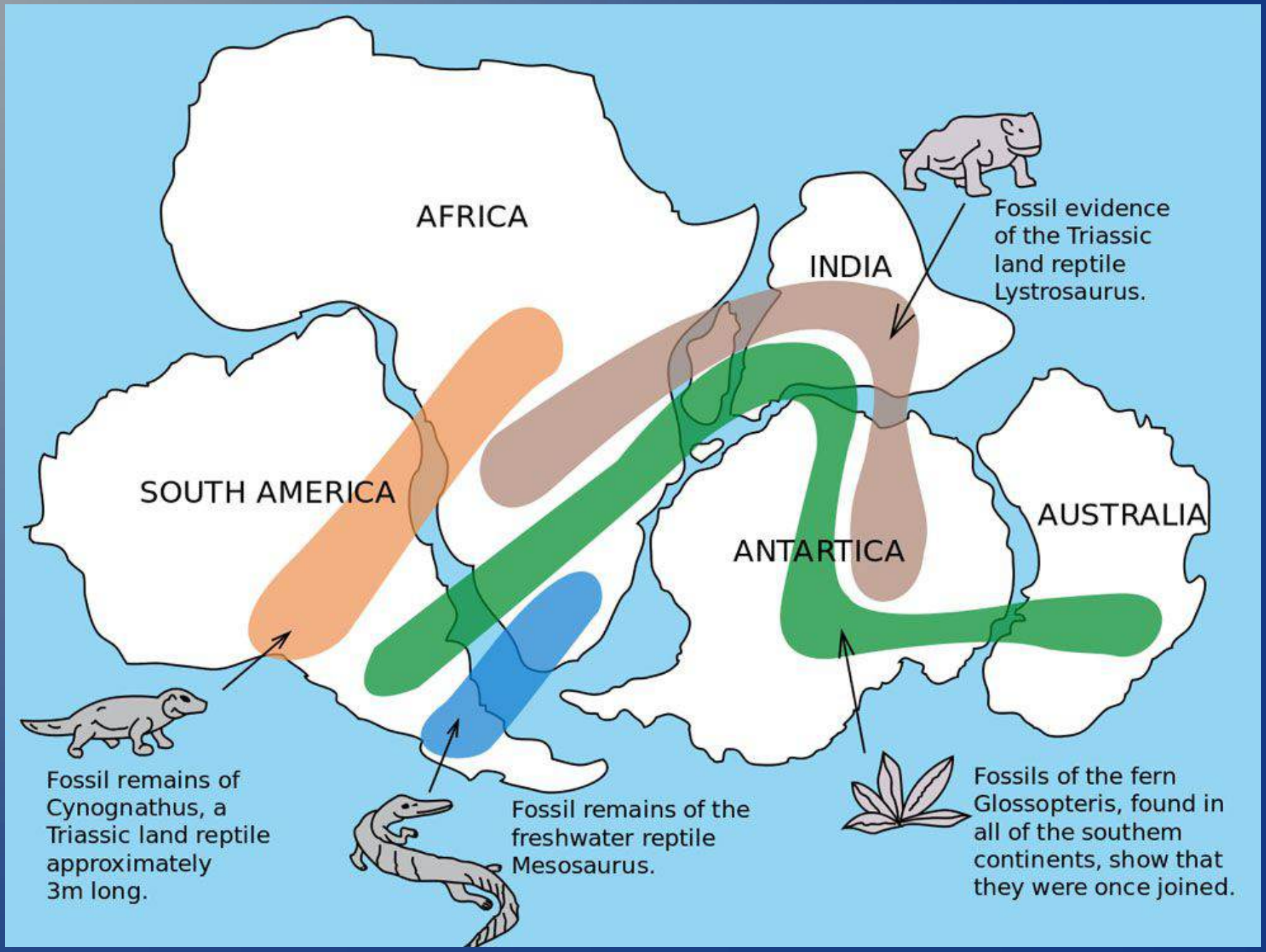


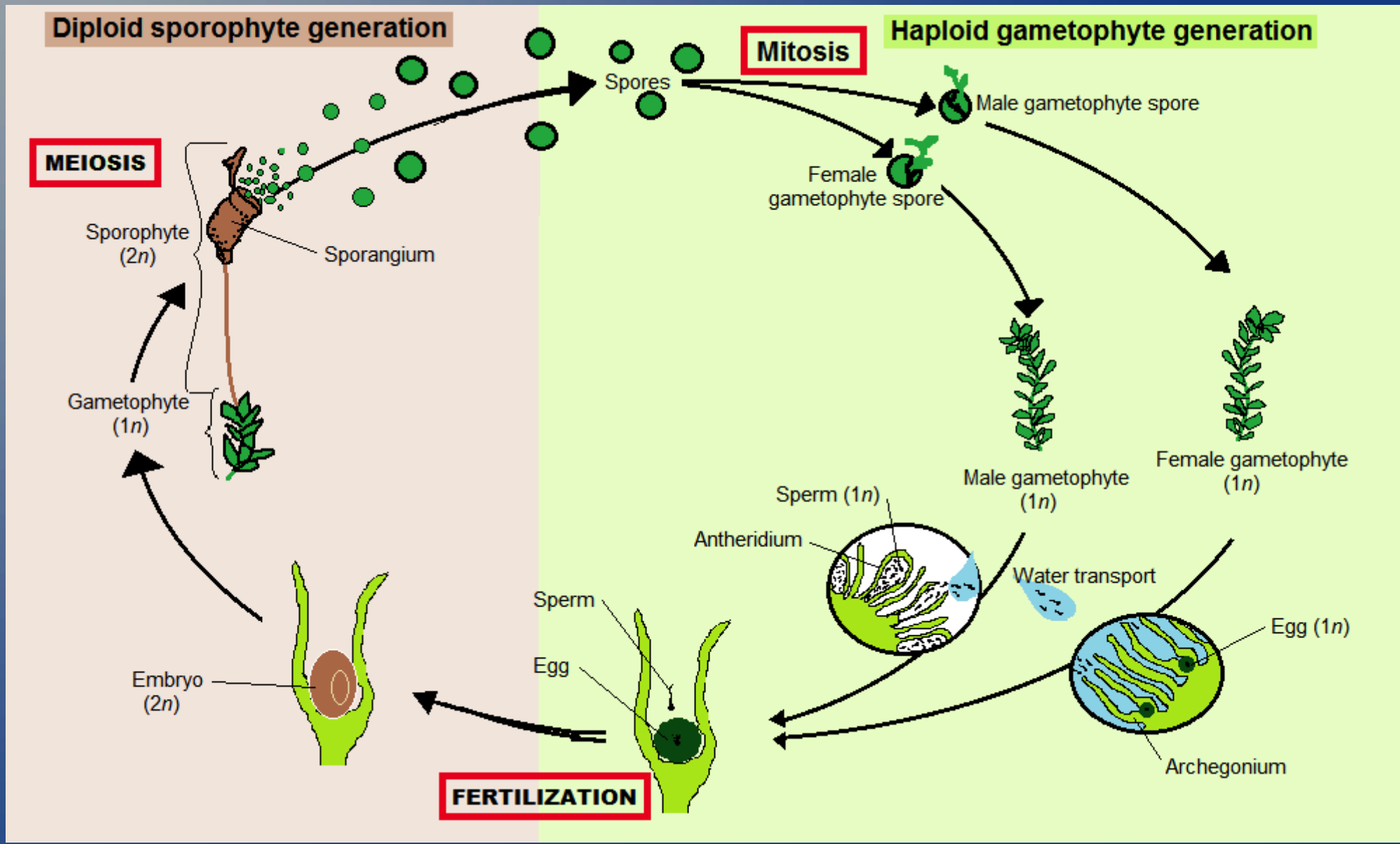


Some Common Mosses, Liverworts, and Lichens of Pacific Northwest Forests

Bryophytes which include mosses, liverworts and hornworts are possibly the oldest plants and are related to, it is thought, algae. Based on fossil records, they may date some 400 million years and provide evidence for the supercontinent Pangea from their fossilized and current distribution.


AFRICA
INDIA
Fossil evidence of the Triassic land reptile Lystrosaurus.
SOUTH AMERICA
AUSTRALIA
ANTARTICA
Fossil remains of Cynognathus, a Triassic land reptile approximately 3m long.
Fossil remains of the freshwater reptile Mesosaurus.
Fossils of the fern Glossopteris, found in all of the southem continents, show that they were once joined.

The existence of lignin, which contains silicates and acts as a stiffener, segregates younger angiosperms and old ferns from bryophytes. Bryophytes also have a different life regimen and different reproductive characteristics than *vascular plants*.

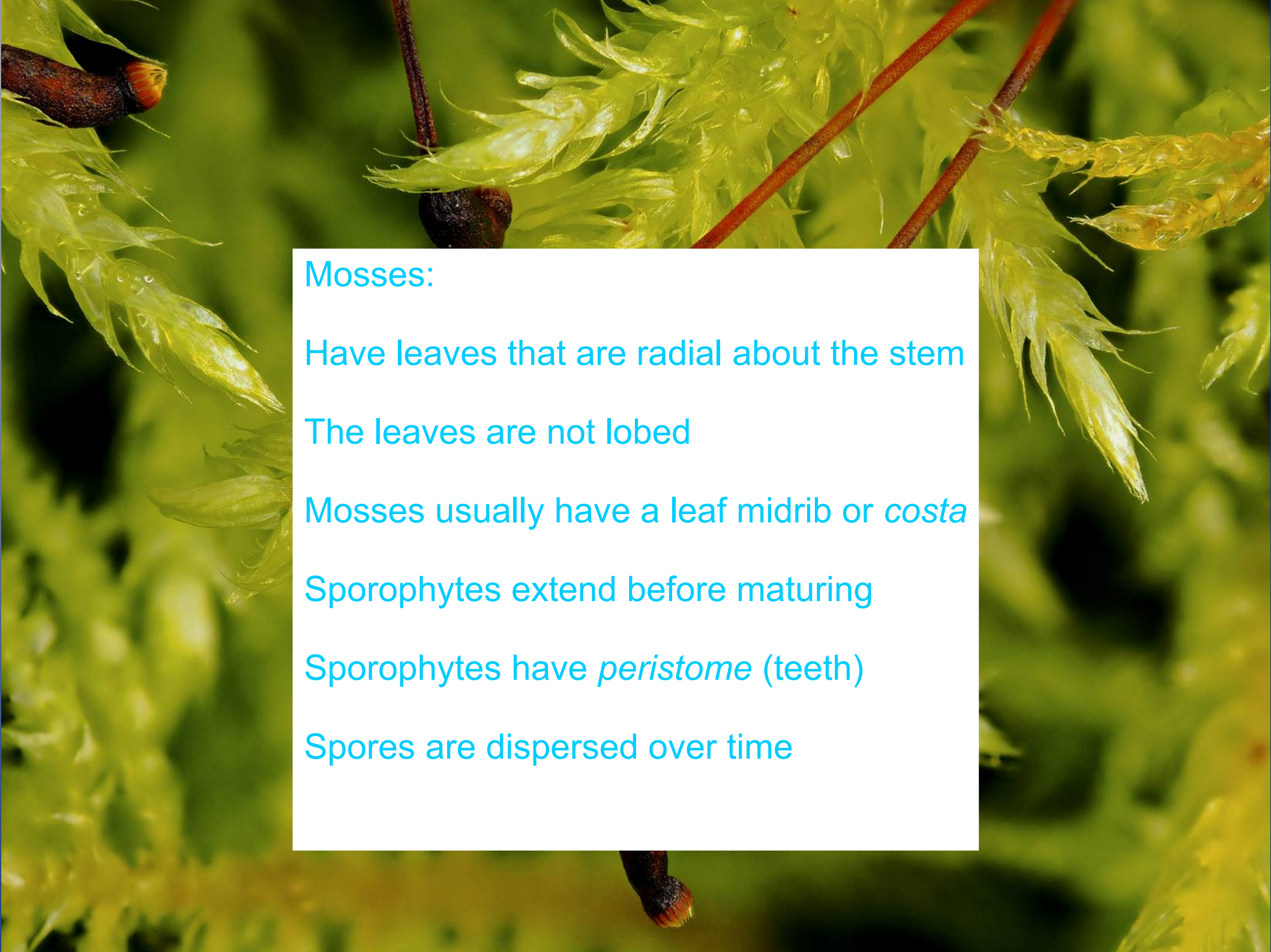

Diploid sporophyte generation
Haploid gametophyte generation
Mitosis
Spores
Male gametophyte spore
Female gametophyte spore
MEIOSIS
Sporophyte (2n)
Sporangium
Gametophyte (1n)
Male gametophyte (1n)
Female gametophyte (1n)
Sperm (1n)
Antheridium
Water transport
Egg (1n)
Archegonium
Sperm
Egg
Embryo (2n)
FERTILIZATION

Lichens are not a plant per se, but are a synergy of an algae, a fungus, and cyanobacteria. Both Bryophytes and Lichens photosynthesize for life energy.

Bryophyte and Lichen differences


Rainfall and localized water retention influences the desirability of habitat for both Bryophytes (Mosses and Liverworts) and for Lichens

Microhabitats are very important. The flat areas are densely populated.



Mosses:

Have leaves that are radial about the stem

The leaves are not lobed

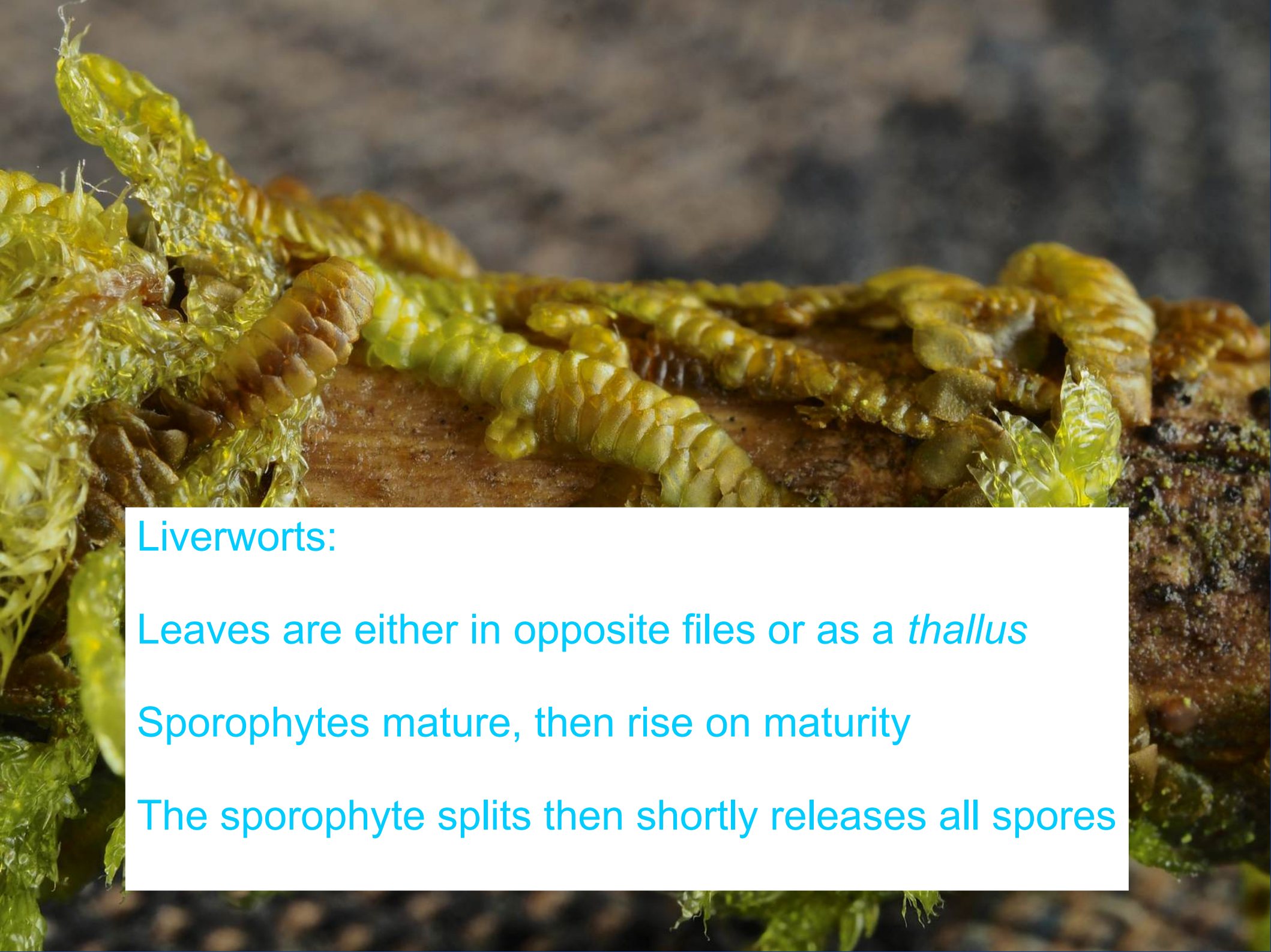
Mosses usually have a leaf midrib or *costa*

Sporophytes extend before maturing

Sporophytes have *peristome* (teeth)

Spores are dispersed over time


Sporophytes and *peristome* teeth



Liverworts:

Leaves are either in opposite files or as a *thallus*

Sporophytes mature, then rise on maturity

The sporophyte splits then shortly releases all spores


Liverwort with *“thalli”*

Mosses and Liverworts can be difficult in identification:

They are all small

They are mostly in shades of green

Resources and good images are difficult to find

Small plants & small pictures don't lend themselves to easy identification

Mosses and Liverworts can be identified:

By habitat of rock, epiphytes (trees), or soil

By the amount of moisture and exposure to sun

By form (habit or growth form)

By characteristics of the leaves, sporophytes, or stems;
this can involve the use of a loupe or macro camera lens

Perhaps a couple hundred of the 750 Washington mosses
can be identified in this way. Others require electronic magnification;
some liverworts (and lichens) require chemical or DNA tests

So the question is how to get started – seems overwhelming

Learning anything new means taking small steps and gradually reaching new thresholds

There are only a couple of common books and websites that are arranged to look up images as a starting point

Most good websites organize images by scientific names

If you find Mosses, Liverworts and Lichens interesting and want to go further, learn genera but not necessarily species

Depending on your goals as naturalists you may want to photograph what you see to maintain a record (250 Mosses)


Leaf detail – shape, curvature, *acumen*


Sporophyte detail


Leaf midrib (*costa*) and marginal teeth

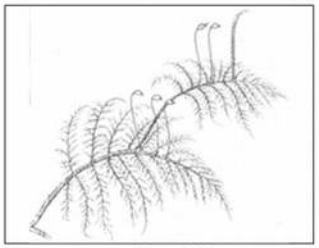

Splash cups collect water and help in sperm dispersal


Hyaline or clear *hairpoints* aid in identification

Common Mosses & Liverworts

Lowland Westside PNW Forests

Summary of Major Moss Growth Forms



Feather-like

Irregular Branching

Tree or Shrub-like

Grass-like

Flattish Mats

Draping, Hanging

Key

Boarder

Bold: This moss is common
Not Bold: This moss is not as common

Color of Common Name

Green: Found mostly in trees (epiphytes)
Red: Found mostly on the ground. Could be on soil, logs, humus or the lower part of trees.
Black: Found mostly on rocks or rocky soil.

Descriptions

Bold: Major identification characteristics. Focus on these words.
Not Bold: Descriptive & interesting but not a major identifier.

Moist environments

This moss is found in wetter areas

Some fun facts about bryophytes:

Mosses can produce thousands to millions of spores in a single *capsule*

Liverworts can produce up to thousands of spores in a single *capsule*

Some mosses can survive many years of nearly complete dehydration

When wetted, mosses can begin to photosynthesize in a few minutes >+10C

Mosses and Liverworts can reproduce from *asexual gemmae* and *vegetative propagules*

Some mosses and liverworts are not known to have ever produced sporophytes

Finally:

Bryophytes are important in moisture retention and soil development

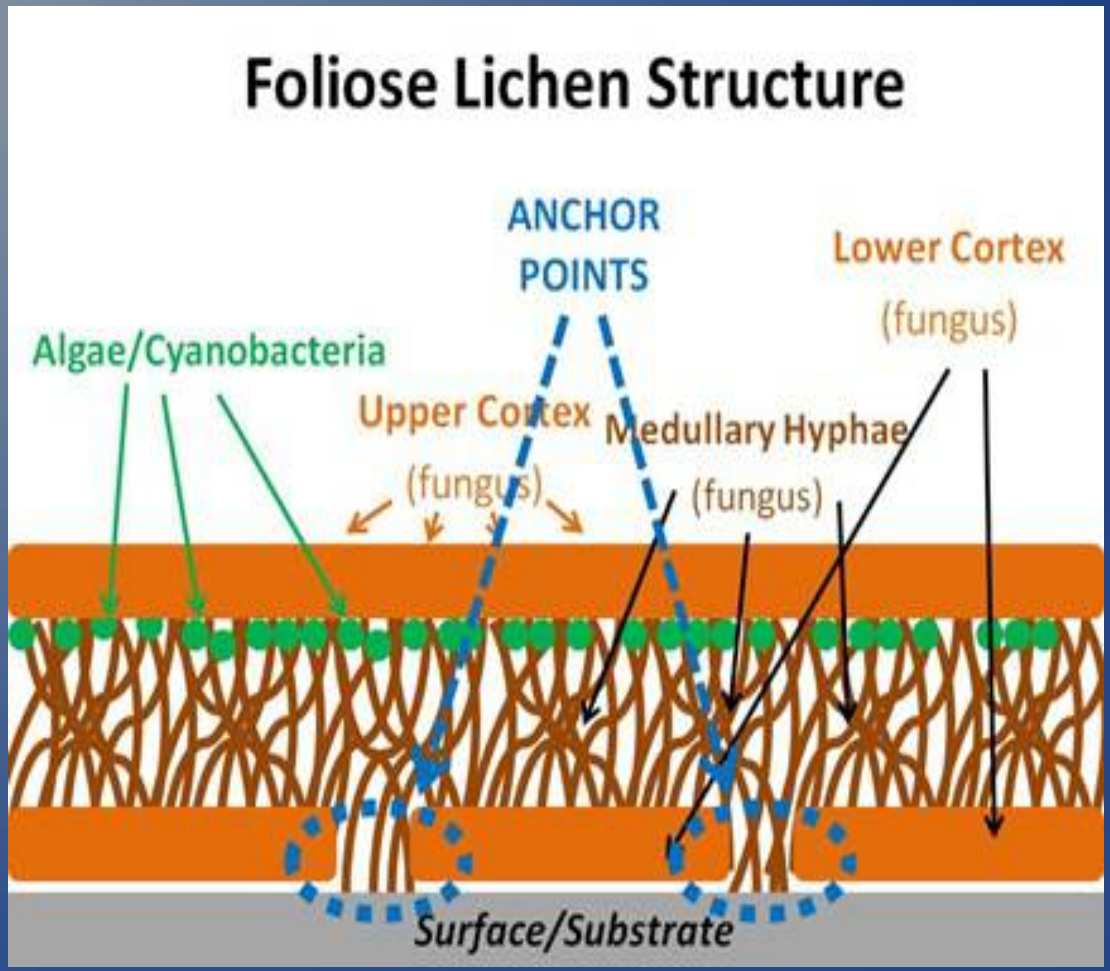
Bryophytes form a unique habitat for many plants and creatures

And now.....on to Lichens

Lichens are a symbiotic synthesis of a fungus, algae and cyanobacteria.

The fungus forms the structure of the lichen, absorbs water and minerals from it's substrate, and enables the algae in it's chemical activity.

The algae photosynthesizes and produces most of the energy of a lichen.


Foliose Lichen Structure
ANCHOR POINTS
Lower Cortex
(fungus)
Algae/Cyanobacteria
Upper Cortex
(fungus)
Medullary Hyphae
(fungus)
Surface/Substrate

Reproduction of lichens (and of Bryophytes) can be vegetative when parts break off and form new plants.

Many Lichens can also reproduce in the production of specialized products not unlike spores in a Bryophyte.


An apothecia is a reproductive organ

Lichens can be:

crustose - appressed to the substrate,

foliose – leaf-like,

or fruticose - shrub-like in form.


Crustose – appressed to the substrate


Foliose – or leaf-like


Fruticose – or shrub-like

Common Lichens You Can Identify

Foliose

Frog Pelt Lichen
Peltigera
Grey, brown, greenish
Large lobes.
Large apothecia, often.
Rhizines sometimes long.

Lung Lichen
Lobaria
Grey, brown, greenish
Large lobes -- deaply indented.

Shield or Waxpaper Lichen
Parmelia
Grey-green (top) Blackish (below)
Appressed small lobes.

Rag Lichen
Platismatia
Grey-green (top) White/brown (below)
Loose large lobes.
Highly variable.

Tube Lichen
Hypogymnia
Grey-green (top) Black (below)
Hollow tube-like lobes.
Appressed or erect.
.

Fruticose

Antler Lichen
Evernia
Grey-green (top) White (below)
Bushy, lobes straplike.
Lobes divide (forks) regularly.
Fruiticose/foliose

Cladonia
Cladonia
Color varies.
Primary: small appressed scales.
Secondary: erect finger like podetia.
Large genus, much variation.

Ramalina
Ramalina
Grey-green (top & bottom)
Tufted, lobes narrow
Lobes divide (forks) unevenly.

Beard Lichen
Usnea
Light green
Tufted & hairlike or long & pendulous.
Central cord.

Witch's Hair
Alectoria
Light green.
Pendulous hairlike (no central cord)

In late January or early February we will have a moss and lichen workshop in which we use Stewart's Bryophyte and Lichen charts to enable an interested student to get their foot in the door. The charts have about 40 mosses that we find most often in local forests and also 20 of the more common Lichens.

Going beyond this is much more difficult but is extremely challenging and rewarding as one combines study and photography of beautiful subjects with almost a detective-like sleuthing of observations and resources. Join us next winter.


Thanks!