

Spore-Dispersing Vascular Plants Introduction - 1

The vascular plants are divided artificially into two major groups, the seedless (or spore-dispersing) vascular plants and the seed plants. There are four major Phyla of spore-dispersing vascular plants plus three extinct phyla for which excellent fossils remain.

The spore-dispersing vascular plants include the:

Rhyniophyta – Extinct

Zosterophyllophyta - Extinct

Trimerophytrophyta - Extinct

Lycophyta (Lycopodiophyta)

 Lycopodiae

 Selaginellae

 Isoetae

Monilophyta or Pteridophyta* (*sometimes* Pterophyta)

 Equisetales (Sphenophyta)

 Psilotales (Psilophyta)

 Ferns (Pterophyta)

 Ophioglossales – Eusporangiate

 Marattiales – Eusporangiate

 Filicales – Homosporous and Leptosporangiate

 Salviniales – Heterosporous and Leptosporangiate

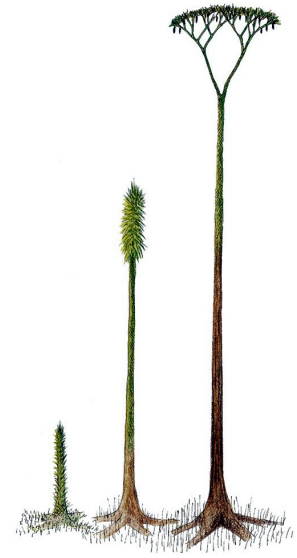
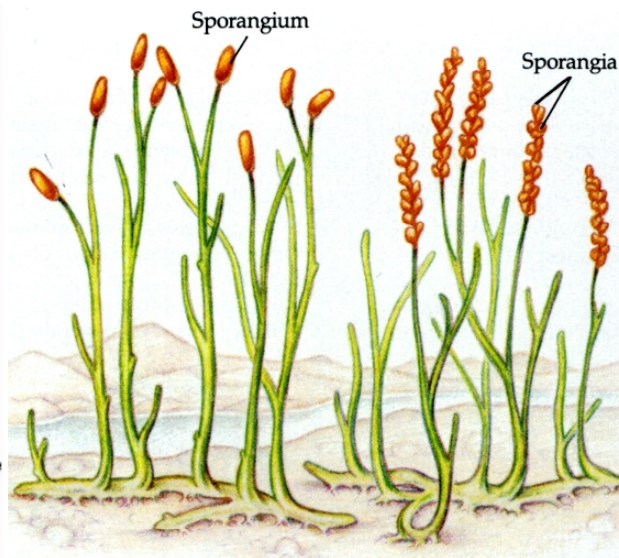
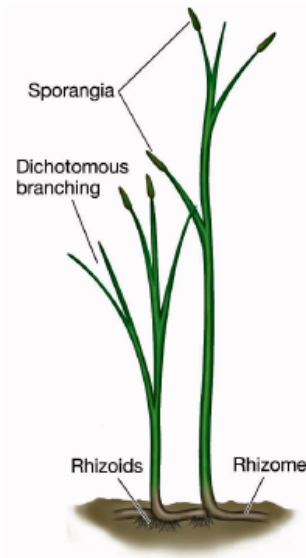
 Marsileales – Heterosporous and Leptosporangiate

* *Traditionally, the groups now clustered into one phylum were considered to be separate phyla, with the name Pterophyta used just for the Ferns. For ease of discussion in Biology 213, the five orders within the ferns will be considered as one group, using the former phylum name, Pterophyta.*

The earliest vascular plants have been reconstructed from the fossil record dating back about 425 million years, with branching sporophytes that were nutritionally independent of the gametophyte. The early vascular plants were small, as are the Bryophytes but their branching patterns provided a means of increasing complexity of the plant body and support for multiple sporangia. However, early vascular plants lacked roots or leaves.

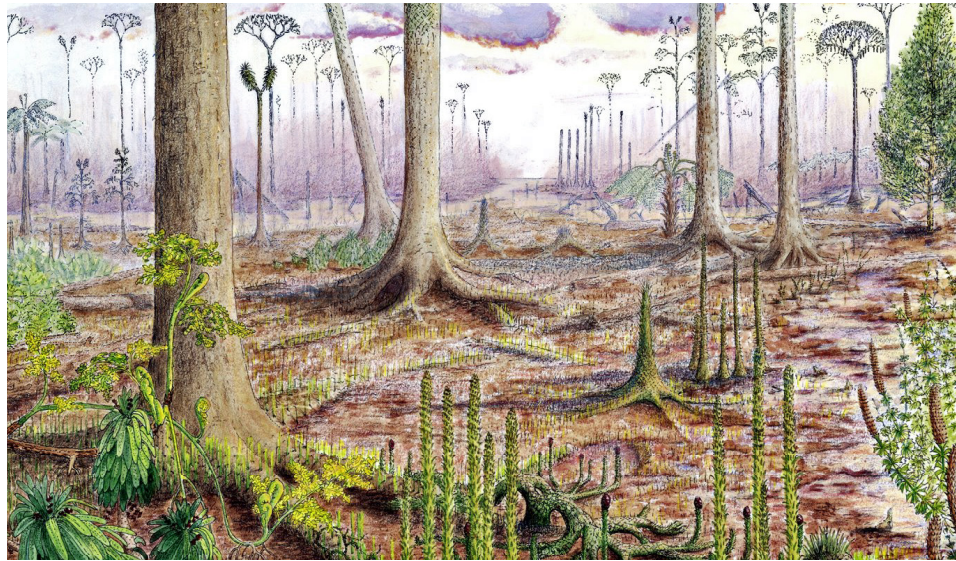
The ancestors of the Lycophyta, Equisetales and Psilotales, extant vascular plants often referred to as the "fern allies", were the first large land plants. Lycophytes and Equisetums are also prevalent in the fossil record. These vascular plant groups are not predominant organisms in our ecosystems today, substantially being replaced in ecosystems by seed plants. In contrast, the ferns, within the phylum, Pterophyta, are conspicuous in many ecosystems, including the Pacific Northwest.

Spore-Dispersing Vascular Plants Introduction - 2



Early Vascular Plant Reconstructions

Fossil Lycophyte Tree



Carboniferous Forest Reconstruction

Spore-Dispersing Vascular Plants Introduction - 3

A Comparison of Some of the Main Features of the Seedless Vascular Plants

PHYLUM	DICHOTOMOUSLY BRANCHED?	DIFFERENTIATED INTO ROOTS, STEMS, AND LEAVES?	HOMOSPOROUS OR HETEROSPOROUS	TYPE OF LEAVES	TYPE OF STELE	SPORANGIA	MISCELLANEOUS CHARACTERISTICS
Rhyniophyta (rhyniophytes)	Often	Stem only	Homosporous	None	Protostele	Terminal	Exclusively fossils; likely ancestors of trimerophytes
Zosterophyllophyta (zosterophyllophytes)	Often	Stem only	Many homosporous; some heterosporous	None	Protostele	Lateral	Exclusively fossils; closely related to lycophytes
Trimerophytophyta (trimerophytes)	Most are not	Stem only	Homosporous	None	Protostele	Terminal on ultimate dichotomies	Exclusively fossils; likely ancestors of ferns, progymnosperms, and perhaps horsetails
Lycopodiophyta (lycophytes)	Some are more or less dichotomous	Yes	Lycopodiaceae homosporous; Selaginellaceae and Isoetaceae heterosporous	Microphyll	Most with protostele or modified protostele	On or in the axils of sporophylls	Members of the Selaginellaceae and Isoetaceae have ligules; many extinct representatives
Pteridophyta (all ferns except whisk ferns)	No	Yes	All homosporous except for Marsileales and Salviniales, which are heterosporous	Megaphyll	Protostele in some; siphonostele or more complex types in others	On sporophylls; some clustered in sori	Ophioglossales and Marattiales eusporangiate; Filicales, Marsileales, and Salviniales leptosporangiate
Pteridophyta (whisk ferns)	Yes	Stem only	Homosporous	Scalelike in <i>Psilotum</i> , with a single vein in <i>Thespteris</i> ; derived conditions	Protostele	Lateral	Resemble rhyniophytes in aspects of structure, but structure considered to be derived
Pteridophyta (horsetails)	No	Yes	Homosporous; some fossils heterosporous	Microphyll-like through reduction	Eustele-like siphonostele	On sporangio-phores in strobili	Represented today by single genus, <i>Equisetum</i> , the horsetails