



## Topic 8: Ferns

### FERNS

#### ***Did you know that,***

- Ferns appeared in the fossil record over 300 million years ago.
- There are far fewer kinds of ferns than later evolving plants.
- There are over 400 species of ferns in Australia and over 10,000 species worldwide.
- In Australia, ferns occur mostly along the east coast.

### Habitat

As ferns need water to reproduce, they are mostly found in rainforest or other moist environments, like creek beds. However, there are some that grow in drier situations and some that are drought resistant. An example of this is *Cheilanthes*, a type of Resurrection Fern, as it will green up and stand erect after rain although it appeared to be dead. There is even a fern which grows in mallee sand hills, another in sub-alpine crevices which can be snow covered, and one in salt-sprayed crevices on the coast.

### Growth

Ferns can be terrestrials, rooting on the ground; they can be lianas or creepers; epiphytes living on the plants but feeding from airborne moisture and compost caught in their structures; lithophytes, living in a similar manner to epiphytes but on rock; or in water.

They range in size from tree-like structures, 20m tall, to tiny flimsy ferns only one cell layer thick. The latter are subject to drying out so they can only live in very humid atmospheres.

Growth of a frond is at the apex. The young leaves are rolled in tight spirals, unwinding as they mature.

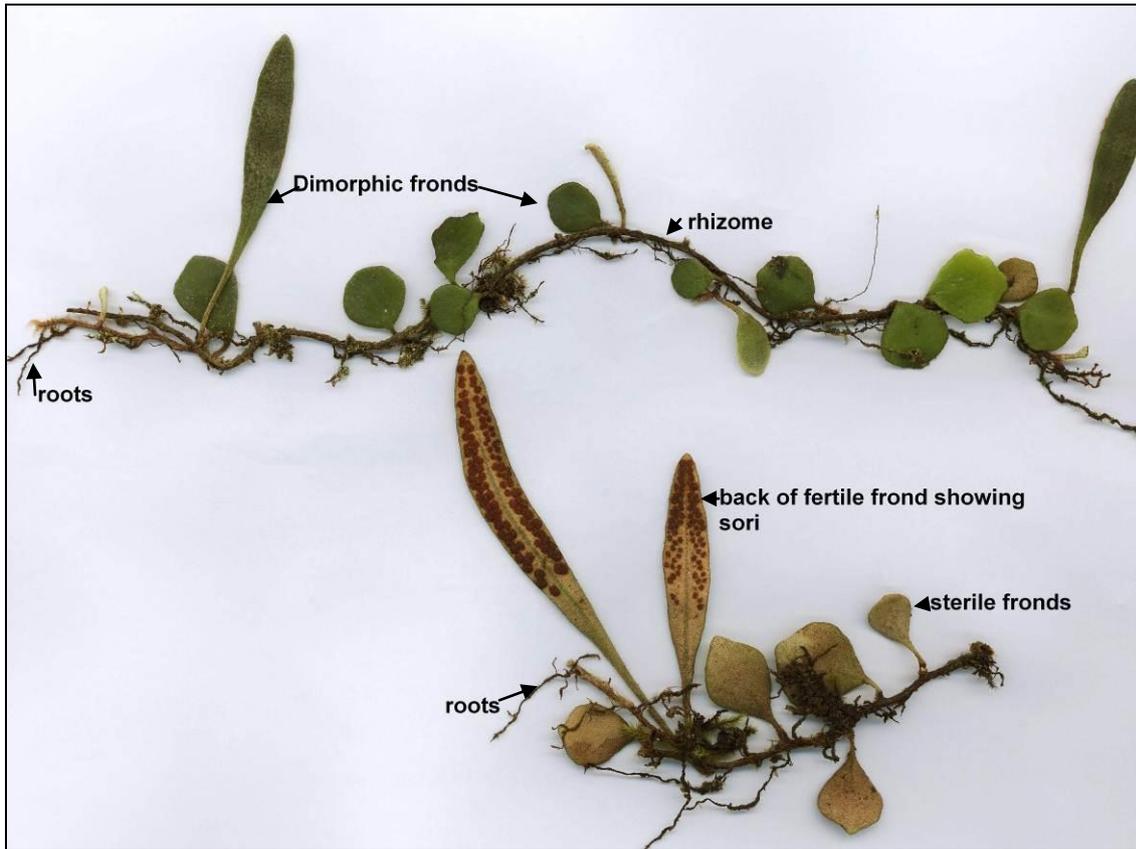
### Structure

Like all higher plants, ferns are [tracheophytes](#), i.e. they have vascular bundles to carry water and nutrients, sap, through them.

They are like most plants in that they consist of a stem, called a rhizome, from which roots grow into the soil, and leaves are held up. The leaves are green and carry on photosynthesis.

**Rhizome** – is the stem of the fern plant. It can be vertical, as in the tree-fern. It is held up by a strong girdle of [sclerenchyma](#) in association with the leaf bases and densely matted aerial roots. Most rhizomes are prostrate, so the plant is spread along the ground. In moist tropical areas the rhizome may run over the ground, but in drier areas the rhizome grows under the ground, as it does with Bracken Fern.

The rhizome can be long-creeping, so fronds arise at a distance from one another, like Bracken, or they can be short-creeping, producing a tufted fern like *Blechnum* species.



*Pyrrhosia rupestris*



*Sticherus flabellatus*



*Gleichenia rupestris*

**Fron**d – is the leaf. It may be only a few centimetres long, as in filmy ferns or it may be several metres long, as in the Tree-fern.

The leaf blade can take various forms. It can be strap-like, **simple**, as in the Bird’s Nest Fern. It can be once-divided, **pinnate**, as in *Blechnum sp* or *Lindsaea linearis*. It can be twice-divided, **bipinnate**, or thrice-divided, **tripinnate**, as in *Cheilanthes sieberi*.



*Asplenium australasicum*



*Lindsaea linearis*



*Cheilanthes sieberi*

**Sori** (plural of **sorus**) – are arranged in many ways on the undersides of the fronds. These patterns are used by taxonomists to classify and identify ferns. See next page.

Sori may be: in a line along the lateral veins (*Asplenium australasicum*); in a line along either side of a pinna central vein (*Blechnum*); in rows midway between pinnule mid-vein and leaf margin (*Cyathea cooperi*); along the pinnule margin (*Dicksonia antarctica* – in this species the leaf margin is rolled well over the sorus to meet in an indusium); along the upper leaf margin which is slightly rolled over the elongated sorus (*Adiantum formosum*).

**Indusium** – is a thin outgrowth from the frond that grows partly over the sorus to protect it. They come in many shapes. Some sori are naked, called exindusiate. A false indusium is formed by the leaf margin curving over the sorus.

# FERN & FERN ALLIES

## SORI



*Adiantum formosum*  
false indusium



*Asplenium flabellifolium*  
elongated indusium



*Cheilanthes distans*  
false indusium



*Christella dentata*  
central indusium



*Davallia pyxidata*  
cup-like indusium



*Dicranopteris linearis*  
no indusium



*Doodia aspera*  
elongated indusium



*Doodia linearis*  
elongated indusium

*Lindsaea microphylla* elongated  
terminal indusium



*Lycopodiella lateralis*  
single sorus



*Gleichenia microphylla*  
2-4 sporangia

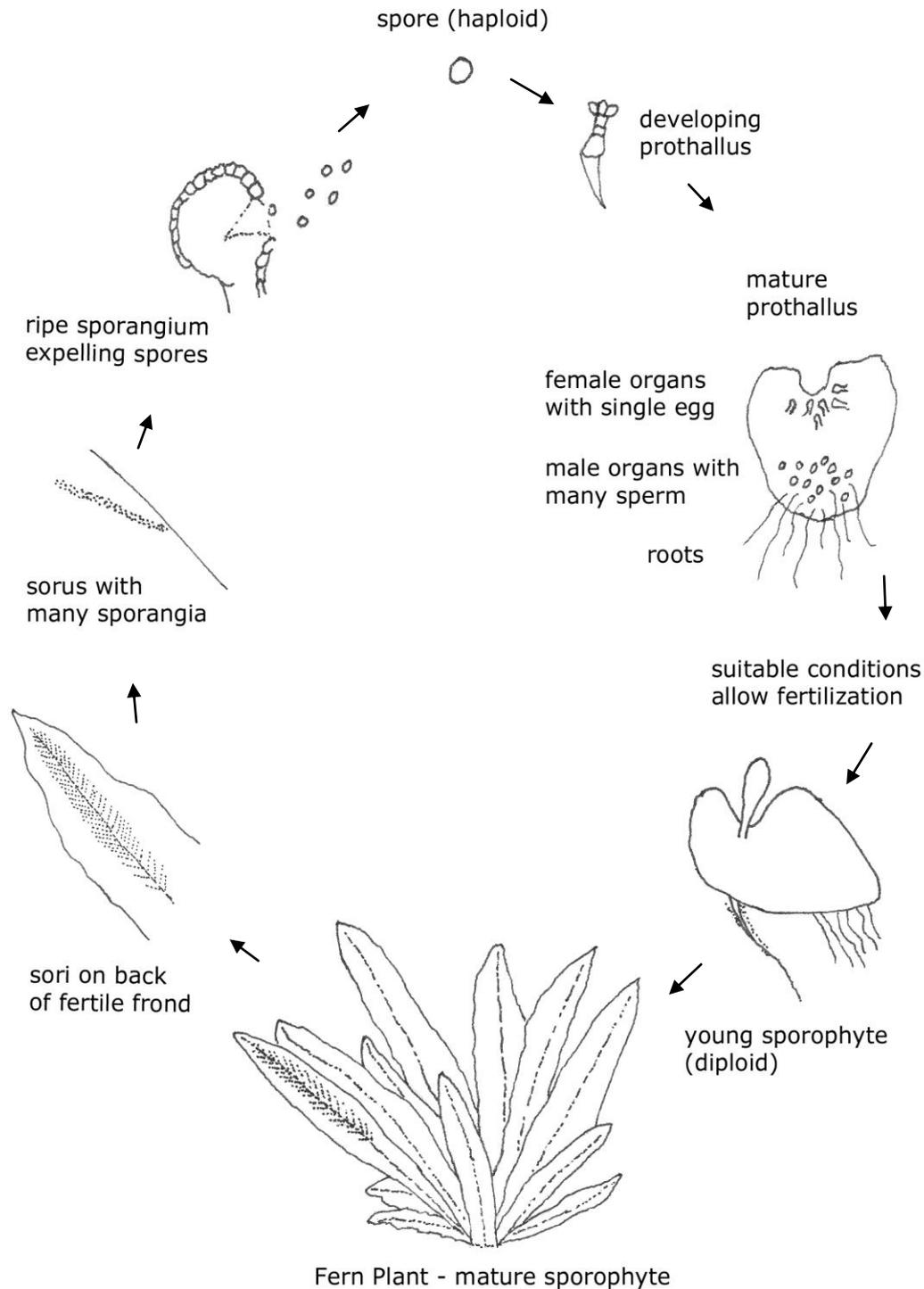


*Gleichenia dicarpa*  
2 sporangia

**Dimorphism** – is the condition where the fertile frond, bearing sori on the under-surface of the frond, is noticeably different in form from the sterile frond. Examples of this are *Doodia caudata*, *Blechnum cartilagineum*.

## Reproduction

Ferns can reproduce either sexually or asexually. **Sexual** reproduction is described in the following diagram.



### FERN LIFE CYCLE

Asexual reproduction is by the rhizome between fronds dying, separating them. Some ferns produce small plants by budding on the frond, as in *Polystichum proliferum*, and *Asplenium bulbiferum* (Mother Spleenwort).

## Fern Allies

Fern allies are ancient plants, like ferns. They are termed "fern allies" because they co-existed with ferns in the early years of the evolution of plant life on land, and also reproduced by [spores](#), not seeds. Many of the current species, in *Lycopodiaceae* and *Selaginellaceae*, had already taken a different evolutionary path from the true ferns, and although they flourished during the Late Devonian and Carboniferous eras very few have made it through to modern times.

One of the oldest plants of all, predating the true ferns by about 75 million years, is *Rhynia*. It is very similar to the skeleton fork fern or [Psilotum nudum](#) which occurs along coastal districts all around Australia and the western Pacific. It has changed little in 400 million years. It consists of a rhizome which absorbs nutrients by rhizoidal hairs in association with [mycorrhizal](#) fungi. The forking rhizomes and the stems bear small scale or leaf like appendages. The stems bear [stomata](#) and are photosynthetic. Thick-walled yellow [sporangia](#) are borne at the end of short side branches. It can be found growing out of crevices in Hawkesbury Sandstone cliffs, occurring locally on the Mueller Track in the Wildflower Garden, North Epping, Mt Colah and Berrilee.

The *Lycopods* developed internal structures which enabled them to grow into trees of up to 45m. During the late Devonian and Carboniferous ages they dominated many parts of the world with dense forests. Surviving members are small herbs, some of which can be found in Sydney bushland. *Lycopods*, like ferns and *Psilotum*, also have horizontal rhizomes, root hairs or rhizoids, and aerial stems.

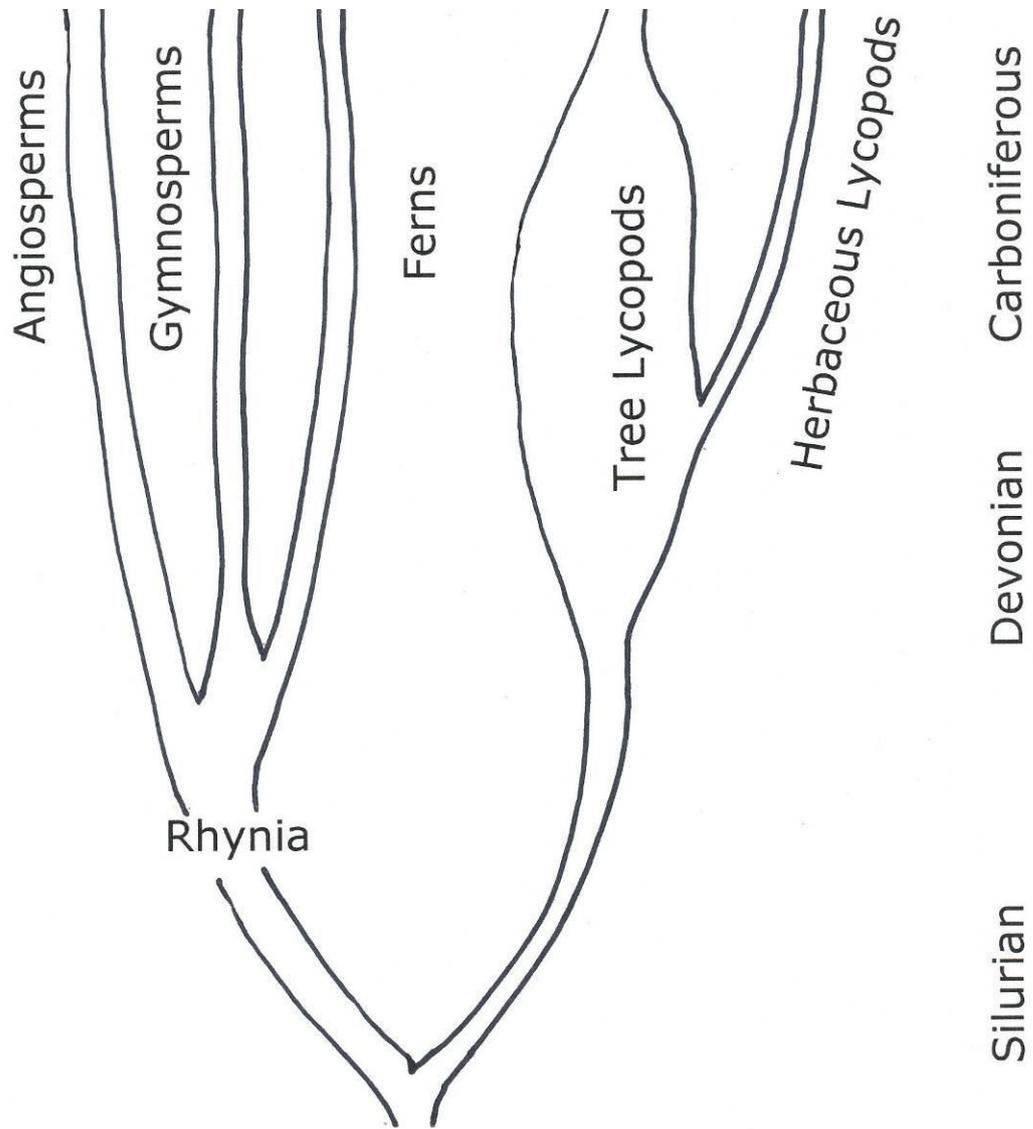
Three species can be found in the northern suburbs - [Lycopodium deuterodensum](#), [Lycopodiella lateralis](#) and [Lycopodiella cernua](#). They do not produce fronds but have stems bearing simple, single-veined small leaves. Spores are borne in terminal club-like cones, called "strobili".

*Lycopodium deuterodensum* bears two types of aerial stems, sterile and fertile, with different leaves. Leaves on the sterile stems are about 3mm long and spreading. Those on the fertile stems are about 2mm long and appressed.

*Lycopodiella* species have only one type of aerial stem with spreading leaves and terminal [strobili](#). In all three *Lycopods* the strobili are similar - the leaves, [sporophylls](#), are crowded, with sporangia attached to their bases. Spores of only one kind are produced.

*Selaginella* is represented in Sydney by one native species, [Selaginella uliginosa](#), and one introduced species, *S. kraussiana*. They are similar to *Lycopods* in many ways, but they have sporangia of two types, producing spores of two types.

All fern allies, like the ferns, produce alternating [sporophyte](#) and [gametophyte](#) generations. The gametophyte generation, the [prothallus](#), is tiny, producing sex cells, the union of which produces the sporophyte generation which are described above.



Evolution of Ferns and Fern Allies

## Ferns and Fern Allies found in the Ku-ring-gai Wildflower Garden

<a href="#"><u><i>Adiantum aethiopicum</i></u></a>	Common Maidenhair Fern
<a href="#"><u><i>Adiantum formosum</i></u></a>	Giant Maidenhair
<a href="#"><u><i>Adiantum hispidulum</i></u></a>	Rough Maidenhair Fern
<a href="#"><u><i>Adiantum silvaticum</i></u></a>	Forest Maidenhair Fern
<a href="#"><u><i>Asplenium australasicum</i></u></a>	Bird's Nest Fern
<a href="#"><u><i>Asplenium flabellifolium</i></u></a>	Necklace Fern
<a href="#"><u><i>Azolla pinnata</i></u></a>	Azolla
<a href="#"><u><i>Blechnum cartilagineum</i></u></a>	Gristle Fern
<a href="#"><u><i>Blechnum minus</i></u></a>	Soft Water Fern
<a href="#"><u><i>Blechnum nudum</i></u></a>	Fishbone Water Fern
<a href="#"><u><i>Calochlaena dubia</i></u></a>	Rainbow Fern
<a href="#"><u><i>Cheilanthes sieberi</i></u></a>	Rock Fern
<a href="#"><u><i>Christella dentata</i></u></a>	Binung, Binung
<a href="#"><u><i>Cyathea australis</i></u></a>	Rough Tree Fern
<a href="#"><u><i>Cyathea cooperi</i></u></a>	Straw Tree Fern
<a href="#"><u><i>Davallia solida</i> var. <i>pyxidata</i></u></a>	Hare's Foot Fern
<a href="#"><u><i>Dennstaedtia davallioides</i></u></a>	Lacy Ground Fern
<a href="#"><u><i>Deparia petersenii</i> subsp. <i>congrua</i></u></a>	Japanese Lady Fern
<a href="#"><u><i>Dicksonia antarctica</i></u></a>	Soft Tree Fern
<a href="#"><u><i>Dictymia brownii</i></u></a>	Strap Fern
<a href="#"><u><i>Doodia aspera</i></u></a>	Rasp Fern
<a href="#"><u><i>Doodia caudata</i></u></a>	Small Rasp Fern
<a href="#"><u><i>Gleichenia dicarpa</i></u></a>	Pouched Coral Fern
<a href="#"><u><i>Gleichenia microphylla</i></u></a>	Scrambling Coral Fern
<a href="#"><u><i>Gleichenia rupestris</i></u></a>	Coral Fern
<a href="#"><u><i>Grammitis billardierei</i></u></a>	Finger Fern
<a href="#"><u><i>Grammitis stenophylla</i></u></a>	Finger fern
<a href="#"><u><i>Histiopteris incisa</i></u></a>	Bat's Wing Fern
<a href="#"><u><i>Hymenophyllum cupressiforme</i></u></a>	Common Filmy Fern
<a href="#"><u><i>Hypolepis muelleri</i></u></a>	Harsh Ground Fern
<a href="#"><u><i>Lindsaea linearis</i></u></a>	Screw Fern
<a href="#"><u><i>Lindsaea microphylla</i></u></a>	Lacy Wedge Fern
<a href="#"><u><i>Lycopodiella cernua</i></u></a>	Scrambling Clubmoss (Fern Ally)
<a href="#"><u><i>Marsilea</i> sp</u></a>	Nardoo
<a href="#"><u><i>Microsorium scandens</i></u></a>	Fragrant Fern
<a href="#"><u><i>Pellaea falcata</i></u></a>	Sickle Fern
<a href="#"><u><i>Platycterium bifurcatum</i></u></a>	Elkhorn Fern
<a href="#"><u><i>Polystichum proliferum</i></u></a>	Mother Shield Fern
<a href="#"><u><i>Psilotum nudum</i></u></a>	Skeleton Fork-Fern (Fern Ally)
<a href="#"><u><i>Pteridium esculentum</i></u></a>	Common Bracken
<a href="#"><u><i>Pteris umbrosa</i></u></a>	Jungle Brake
<a href="#"><u><i>Pteris vittata</i></u></a>	Chinese Brake
<a href="#"><u><i>Pyrrosia confluens</i></u></a>	Robber Fern
<a href="#"><u><i>Pyrrosia rupestris</i></u></a>	Rock Felt Fern
<a href="#"><u><i>Schizaea bifida</i></u></a>	Forked Comb Fern
<a href="#"><u><i>Schizaea dichotoma</i></u></a>	Branched Comb Fern
<a href="#"><u><i>Selaginella kraussiana</i></u>*</a>	Spreading Clubmoss (Fern Ally, *non-native)
<a href="#"><u><i>Selaginella longipinna</i></u>*</a>	Electric Fern (Fern Ally, *non-native)
<a href="#"><u><i>Sticherus flabellatus</i></u></a>	Umbrella Fern
<a href="#"><u><i>Todea barbara</i></u></a>	King Fern

**Acknowledgements:** Jones, DL & Clemesha, SC *Australian Ferns and Fern Allies*, 1981. Beadle, N. *Flora of the Sydney Region*, 1962.

These notes contain hyperlinks to materials, including images, illustrations, plant descriptions and a glossary from PlantNET, with the courtesy of The Royal Botanic Gardens & Domain Trust, 2013.

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