

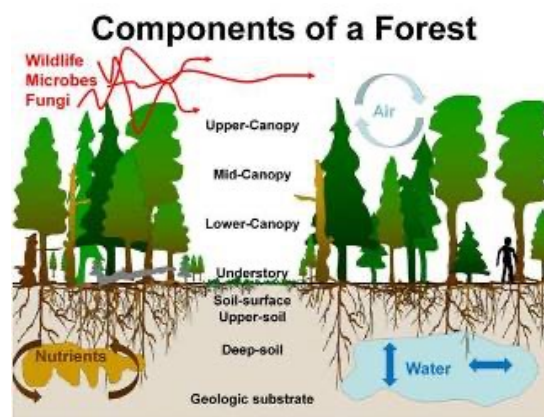
An Introduction to Forest Ecology and Succession

Forest ecology is endlessly fascinating. Terrestrial ecologists investigate the constantly changing world of plants, soils and climate about them. Various components of ecosystems change at different rates in relation to disturbance. In order to predict these changes and manage for them, scientists have been probing the many facets of forest ecosystems for at least 150 years. In the broader scale of history, studies of forests probably have been done since the Greek, Roman and Egyptian Empires. First Nations, whose ancestors first inhabited the Americas, may have had an understanding of ecosystems that dates back 8,000-9,000 years.

Forest ecology is defined as the scientific study of the interactions between organisms and the environment in forests. It includes the study of: trees, soils, climate, insects, fire, other natural and man-made disturbances (like harvesting trees), ecosystem processes (like carbon sequestration or nutrient cycling), and conservation. Forest ecology considers ecosystems and individual factors at one point in time, or over set periods of time in order to understand change.

The main goal of forest ecology is to understand how organisms are distributed, how abundant they are in forests, their interactions, and how numerous factors affect biodiversity. An ecologist is driven to collect information, because the more knowledge we have, the better our understanding and therefore the better our management decisions.

Forest ecology is important because forests cover a large portion of the world's natural landscape and contain a large proportion of the world's species. However, humans often modify forest ecosystems to obtain products and services, such as wood, which can disrupt natural ecological patterns. Forest harvesting is a topic for another day.

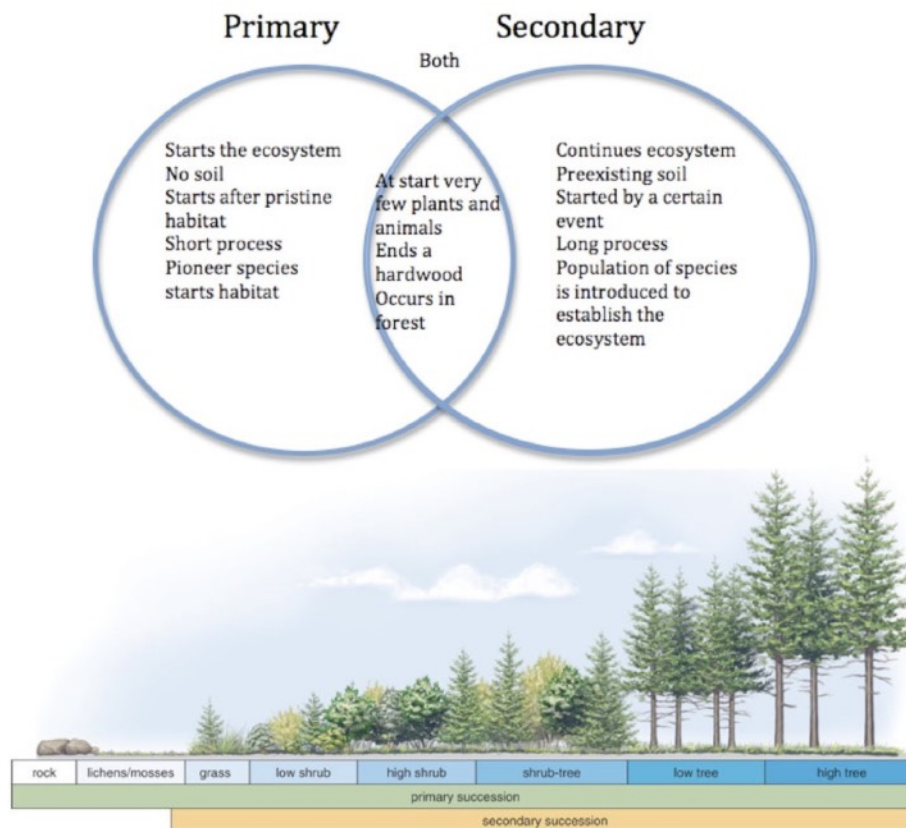


(Understory usually refers to a collective of shrubs, plants, lichens and mosses. Each of these is a layer in its own right however).

Time as a Factor in Succession

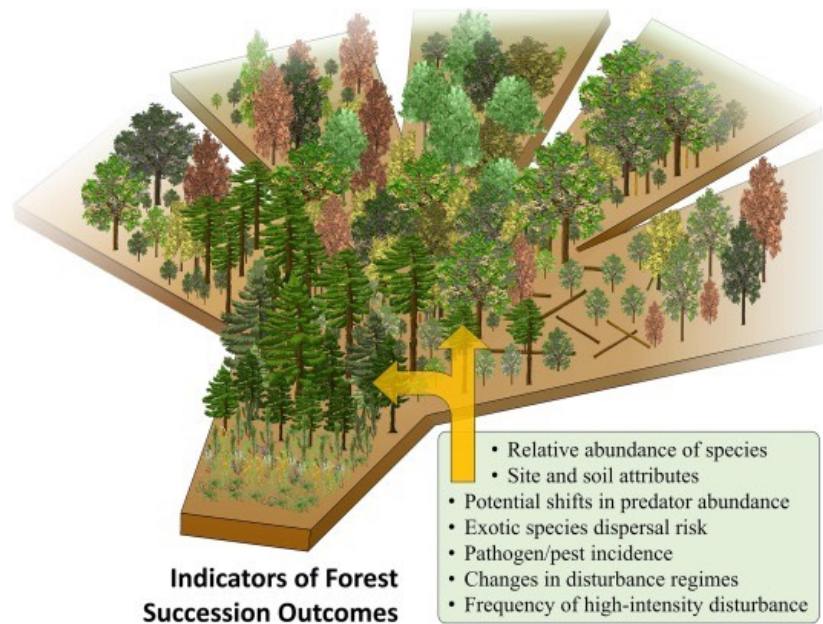
Ecological succession, (the replacement of one ecosystem type with another), often occurs as a result of the passage of time. It may also begin with the response of an existing plant community to a disturbance (e.g., fire, insects, volcanic eruption). **Primary succession** refers to vegetation that occupies land that did not previously have plants, such as soil exposed during glacier retreats, or a new sand bar. If plants occupied a site before disturbance, this type of succession is known as **secondary succession**.

Forest succession is the somewhat predictable change in the dominant species of forest plants. Below is a simple model depicting a single-direction successional pathway, which is not the usual reality for ecosystems.



In BC, with no disturbance, a primary succession model begins with bare soil or rock and then progresses through the following stages: lichens and mosses, shrub and/or deciduous trees, conifer stand initiation, open conifer saplings, closed canopy with young trees, mature conifer stands, and old-growth conifer stands. If climate is kept the same, time is the driver of change here. Decadent stands (the term for very old stands) start the cycle again.

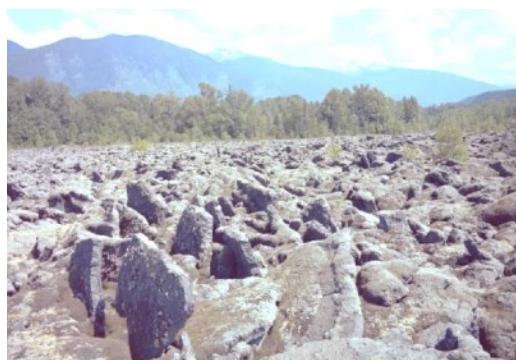
A second more complex model, that may be more realistic, appears on the next page. Some forests can have several concurrent disturbances of different intensities over time so not all outcomes will be the same.



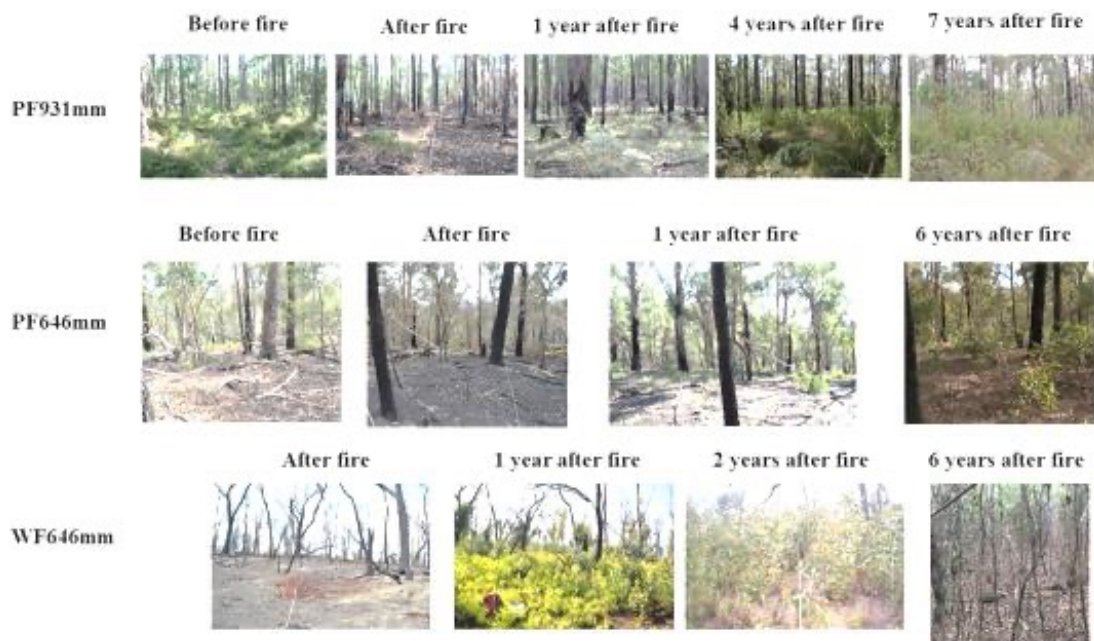
During the early stages of succession, a high proportion of the litter is composed of leaf tissue which, compared to branches and stems, is more easily decomposed by decomposers because of its greater nutrient concentration. In the later stages of succession however, the annual production of tissue falling to the forest floor is composed of more woody tissue (e.g. branches and stems resulting from the self-thinning stage). Woody tissue decomposes more slowly than foliage by a factor of 10 to 100, resulting in nutrients being sequestered (i.e., locked up) for decades in the branches, twigs and logs.

Thoughts to Ponder

- 1) Look at the volcanic eruption depicted on page 4 at New Aiyansh. Determine online when the eruption occurred. What does that tell you in terms of the successional rate on this site? About the soils or lack thereof, as well as the summer temperature? What other factors might be limiting plant growth?
- 2) What are the factors that control plant response after burning? See the figure on page 4.
- 3) What are the advantages of older growth forests in terms of carbon or nutrient storage? The carbon cycle will be covered in greater detail in another bulletin.



Lava Beds at New Aiyansh. (1980 Photo)



Forest plots in a research study of fire intensity and recovery