

Introduction to Succession

Once a new area of land becomes available for colonisation by plants, the composition of the community or ecosystem occupying that land will develop in a predictable and orderly series of stages. Groups of species will be progressively replaced or succeeded by others, as the community moves towards an ultimate or 'climax' composition, beyond which the community is thought to remain stable. This is the concept of succession.

Primary and secondary succession

There are two classes of succession: primary and secondary. Primary succession occurs when vegetation begins to develop on completely new surfaces that have never supported vegetation before. Examples include lava flows and other fresh volcanic surfaces, abandoned river beds and glacial outwash surfaces, sand dunes, and formerly submarine surfaces (e.g. uplifted marine platforms).

Secondary succession occurs when vegetation develops on a surface that was previously occupied by communities, but has since been cleared. The soil cover is typically retained at least in part, and thus retains fertility. Examples include land cleared following burning, abandoned pasture, forest floor exposed to sunlight following tree fall, and land stripped of vegetation by flooding or storms.

Stages of succession, and strategies for survival

The initial stages of a vegetation succession involve a community of pioneer species. These are usually small plants that have adaptations which allow them to survive in the relatively harsh conditions that exist in 'bare' areas (i.e. exposure to sunlight, wind, rain, low nutrient levels, no soil cover, etc.) and have seeds which disperse rapidly to the site, and germinate at the site of succession. Taxa which have these characteristics are referred to as 'ruderal' or 'r-selected' taxa, which refers to their strategies for survival/reproduction. R-selected taxa produce many offspring, which (in the case of plant seeds) are easily and widely dispersed, and can survive in relatively harsh conditions. Lots of offspring are produced, but parental investment is low. Thus only very small proportions are likely to survive and reach adulthood. In plants, this typically manifests as bare, or naked seeds, which are transported by the wind and produced in their hundreds or thousands (e.g. dandelions). They are also typically short lived. The majority of r-selected plant species are annual (as opposed to perennial) which means they only live for one to two years. The pioneer stage is usually followed by further coloniser stages, which are also typically dominated by r-selected taxa.

In areas of primary succession, the establishment of nitrogen (N) fixing species (e.g. in New Zealand - lupin, tutu, gorse) is very important for paving the way for higher species of plants who need good levels of soil N.

The pioneer and coloniser stages are often followed by a series of intermediate stages involving progressively larger and larger species of shrubs and eventually trees, reaching the final, 'climax' stage. Each of the individual stages is called a seral stage. In the more advanced, intermediate stages of succession, we begin to see the replacement of r-selected taxa, with K-selected taxa. In contrast

to r-selected taxa, K-selected taxa are typically larger, longer lived (perennial, living for many years), and cannot tolerate the same harsh conditions as the pioneer species. With respect to reproductive strategy, K-selected taxa take the approach of producing fewer offspring, and putting more energy into ensuring that they might make it to adulthood. So for plants, this would be represented by producing fleshy fruit around the seeds to attract birds or other animals which can act as dispersal agents for the seeds (as opposed to r-selected taxa, which produce bare seeds and cast them out into the wind).

The seeds/young plants of K-selected plants can't establish at a site until a suitable nursery habitat has been produced through modification of the environment (i.e. soil development, nitrogen fixing, producing shelter) by the preceding generations of pioneer plants. However, once the environment is suitable, the young K-selected plants (think species of larger trees and shrubs) can establish, and will eventually grow to shade out the coloniser communities and fully replace them (as the majority of the r-selected species' seeds will not germinate in the shade of other plants).