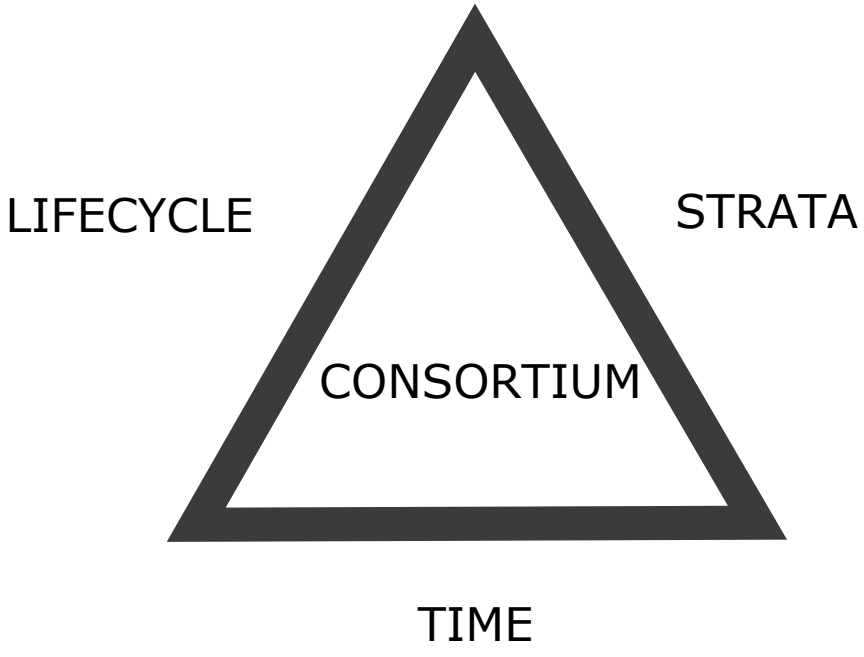
What is a Consortium?

A consortium is a group of plants organised together by lifecycle, strata and influenced by the multiple effects that occur over time. When these three elements combine, a dynamic is formed, where the maximum growth and health of plants occur and disease and pests are few. On the inverse side, when one of the elements reaches a limit, the consortium will stagnate and plants will shut down and pests and disease will occur, plants can become senescent, while other plants will shut down until a disturbance event occurs, which triggers a new growth pulse.

The best way for me to describe this dynamic is visually as a triangle, as it is very important to understand that everything works together at once to create a whole that is more than the sum of the parts. if one side of the triangle is limited, it will pull back the potential of the other sides to this limit. If the effects over time side allows senescence, the consortium can shut down.



Plants are separated by lifecycle and strata as well as the space in the moment of time at planting, reaching up to300% density as compared to maximum monoculture plantings which work in a single dimension. For example plants of two different strata (light requirements) can be planted almost in the same position. When plants are also separated by lifecycle, they can be also planted very close together and benefit - a short lifecycle plant next to a larger and longer lifecycle plant will be gone before the larger and longer lifecycle plant will need the space. A large amount of density is achieved in this arrangement, plus all of the powerful positive feedbacks.

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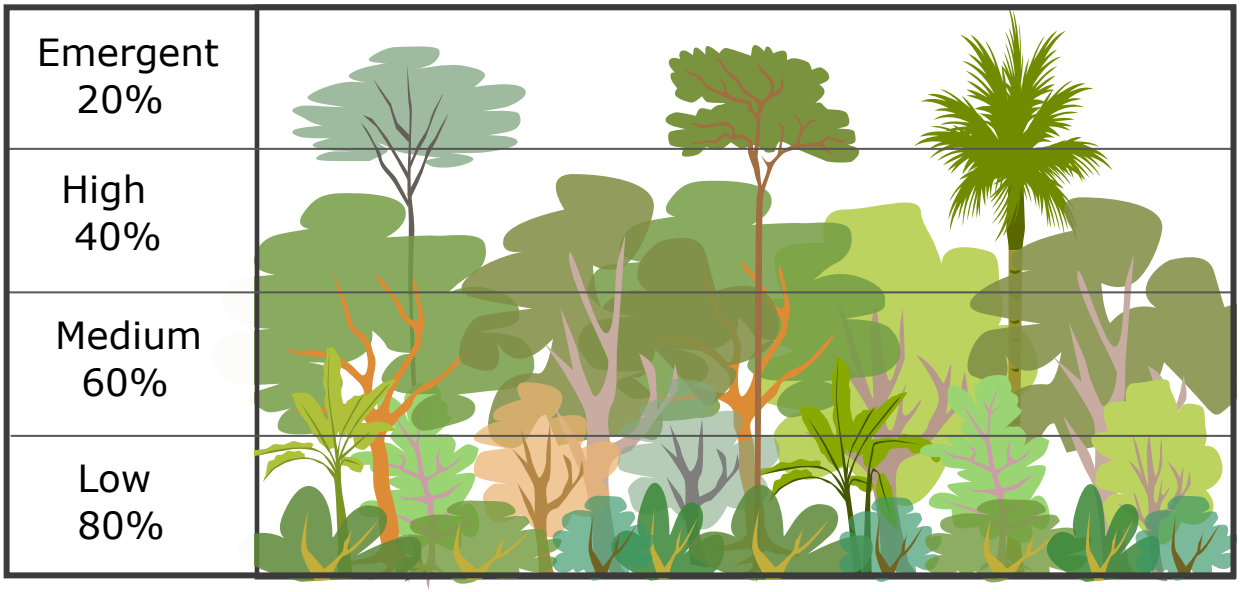
Stratification

Strata relates to the position that a plant takes in a consortium relative to its light requirements. For example, an emergent strata plant will need full sun, where a low strata plant may only need 20% light, or full morning sun for only 15 minutes, Together, plants of different strata can grow very closely together with positive effects.

We generally break up the stratification of a consortium into 4 main groups - Low, Medium, High and emergent. Of course there are many nuances in a real forest, and we quickly start to divide these four groups again into Low, Low/Medium, Medium Medium/High, High, High Emergent and Emergent. Again, the forest is much more nuanced than this basic framework, but for the sake of using this as a planting guide, it is practical. All of the nuances can be observed in practice and managed with pruning.



These percentages are related to maximum monoculture densities, so without including lifecycle differences (assuming all plants are the same age), a total density of 200% is realised.

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Lifecycle

In the context of a consortium, in this sheet, the lifecycle of a plant will be relating to the amount of time that totals it's existence, plus the increase in size over that period. In this case,Plants close together in space can be separated by time, for example, a lettuce can be right next to a young tree, but they will not interfere with each other because the lettuce will be long gone by the time the tree needs the space.

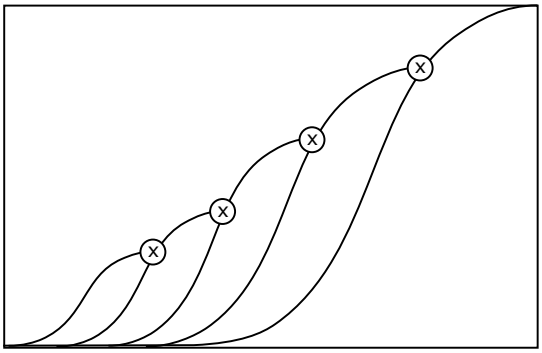

Illustration showing different life spans of plants in a consortium, they are seperated in space by time. Note how all plants begin from the same point of planting. The '**X**" marks the moment in time when the plant is either harvested or pruned, thus giving way to higher succession and longer lived species, plus a growth pulse is triggered and senescence avoided.

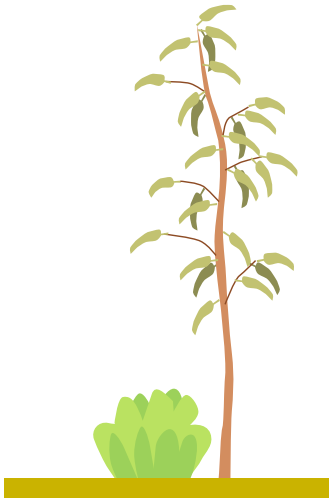

Illustration of a Lettuce ready to harvest next to a juvenile Eucalypt. The plants are not too close together due to the factor of time (and stratification). There are nothing but positive benefits in this, in many ways, this is how nature works.

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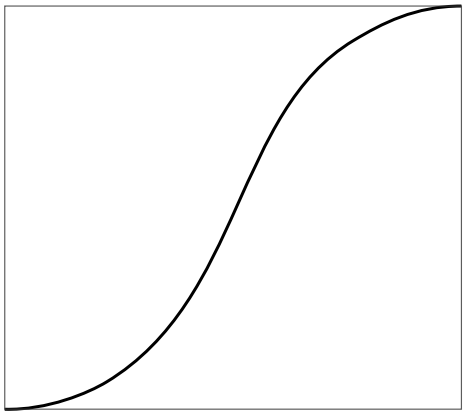
Effects of Time

Time has many effects, outside of what is particularly relevant to the lifecycle of individual plants, so for this reason I add this as an important side of the consortium triangle, as what occurs through time, which also closely relates to plant lifecycle, sets the dynamic in place.

For the sake of understanding the dynamic, the lifecycle side of the triangle is seperate from time, as lifecycle in this framework of insight refers only to the duration of the plants existence and it's increasing size, which is an important element on it's own, as it plays an important role in separating plants spatially.



This illustration shows how the growth of a plant starts slow, speeding up as it enters adolescence, goes through it's most vigorous growth in adulthood to finally slow down as it ages. after the peak of the S curve, the plant will become senescent and slow everything down around it until a disturbance event removes it or prunes it heavily. The disturbance triggers a growth pulse, which we do by careful management via pruning

Plants are the primary source of energy for life on our planet via the process of photosynthesis. The rate of photosynthesis is relative to their growth rate, which follows an "S" curve. In the early part of the plants life, when it is a juvenile, it's rate of photosynthesis is lower in relation to it's mass, as it grows into the prime part of its life, it reaches a maximum rate of photosynthesis, capturing and embodying the sun's energy and feeding life, powering a consortium. Towards the end of its life it slows down, and eventually dies. At the end of the S curve, the plant will become senescent and shut down growth around it as the soil web of life awaits the return of its embodied nutrients in order to recycle them and give to other younger plants. When a disturbance event takes place and the plant is either knocked down or heavily pruned, a growth pulse occurs, triggering a vigorous response. These effects are strongly influential in how a consortium performs.

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Relationships Between Elements The Consortium Triangle

Lifecycle and Time

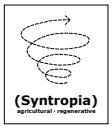
Lifecycle and time relate where age relates to vigour and senescence. Where lifecycle in this context relates to the length of the plants existence and how it increases in size as it grows, The effects over time influence the consortium. When a plant is very young it is nursed by the other older plants and plants of higher strata, but as it grows into adulthood, it feeds energy into the consortium by powerful photosynthesis. It does this by exuding growth hormones and providing sugars to the microbial life below, this helps create a positive feedback loop, making the consortium very powerful. As the plant ages, senescence begins to set in, slowing things down and the rest of the community awaits disturbance, where once that event happens, life is invigorated by the return of the organic matter to be recycled into even more life. Biomass is always increasing in a healthy forest.

Strata and Time

Time effects stratification in a consortium through species succession. In the early period of a consortium, when plants are small, shorter lifecycle pioneers, they are largely emergent, as when plants colonise bare soil, there is no shade for lower strata species, nearly all plants must be emergent. This changes very quickly once life begins and complexity increases, and the lower strata species begin to appear. In a healthy forest, well into the abundant phase of succession, the forest is very well structured, with up to 80% of the plants being low strata. When a consortium in a complex forest is senescent, it is normally dominated by emergent species, with a less complex structure. During this phase, there are a lot of new species dormant as seedlings awaiting disturbance to bring on a growth pulse and a flush of life. In a consortium, your main target crop may be a certain tree species that begins meaningful production around year 6. This tree consortium may consist of a High/Low Strata combination, with the trees being high, and perhaps something such as blueberry as low strata, but up until year 6 when the trees are still growing and do not take up all of the space in the row, the earlier production species may be a combination of medium and emergent.

Strata and Lifecycle

A plant When it is young often requires less light than when it is an adult. For example a long lived emergent giant of the rainforest, such as the Ficus, needs full sun when it is at its peak as a fully mature adult tree, here it is photosynthesising at its maximum rate, feeding life below it as it turns carbon dioxide and photons into sugars and biomass. When this plant is a baby, it needs the care of the other species that are occupying the forest, at that stage of its life it is low strata. As it growth into it's early youth, it may have the light requirements of the medium strata, as it humbly develops under the care of the nursing family of the other forest plants. Keeping this example in mind, we can be most effective in how we plan and manage our consortia.



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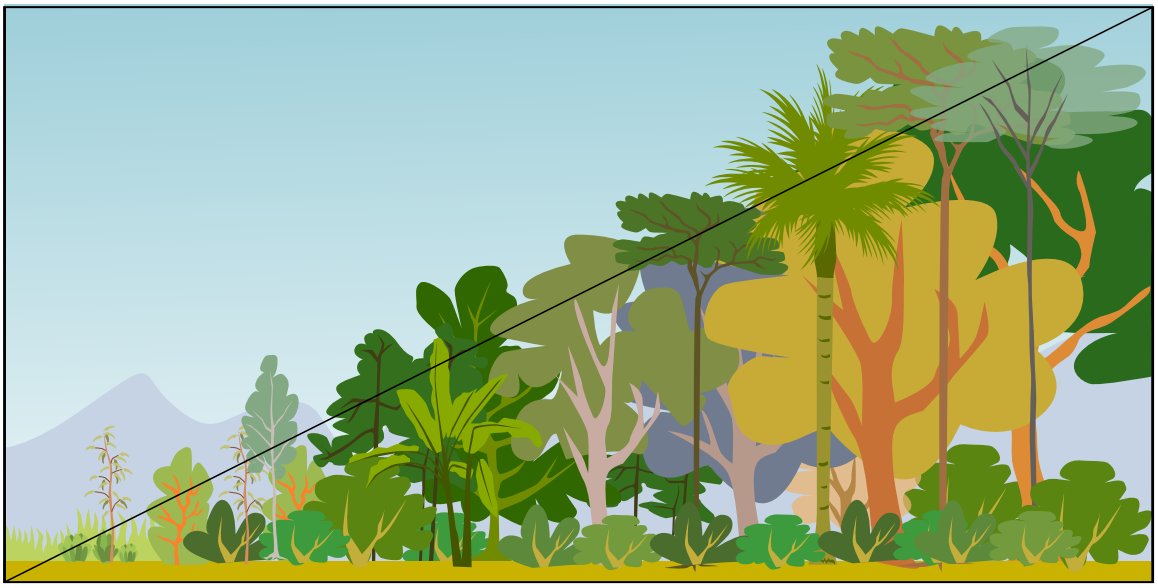
Species Succession



Species succession is the basis of syntropic agriculture, and a consortium is like the vehicle that travels through succession, hence the different species that move in and out of it as succession fluxes - the consortium remains constant. In a natural forest, consortia are random, but observation can reveal the complimentary strata, lifecycle and the different expressions over time. For us, a consortium is really a construct to help us understand and provide a framework to mimic this dynamic of forests. We perceive a consortium in nature (thanks to the insight of Ernst Gotsch) and understand that this repeats throughout the forest, the species may change in each consortium, but they essentially have the same arrangement. In the agricultural context, we create a consortium for our needs and then sequence it along rows to provide the desired amount of production. A consortium grows bigger in scale relative to the size of the species within it and it's progress through succession.

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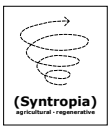
Senescence and Growth Pulses

A growth pulse occurs after disturbance, or another event which effects the consortium, in agriculture this may be a harvest event of a lower succession crop which needs to move out as it nears the end of it's lifecycle and the more time the plant is in the system, the further it may move towards senescence, or a heavy prune to trigger flowering or to adjust stratification. When a disturbance event occurs, the is a strong flush of growth, the macro organism that is the forest as a whole, including all soil life, will organise nutrients, water and hormones etc, to ensure that maximum photosynthesis and energy yield is attained. This phenomena is one of the great miracles of syntropy, amazing results occur from these events. On the other side of this is the counterpart - senescence. Senescence is where a plant is getting old, it shuts down growth around it, there is no vigour or youthful power to realise the increase in life. In nature, a state of senescence may exist for many years, which to us is a long time, but in the big picture it is almost nothing. There are of course natural benefits of senescence, as it is where specialist microbes, plants and animals thrive to help bring the old plants back to the soil. this can be observed by heavy browsing pressure, insect attacks and pathogenic fungi and other microbes. A lot of natures habitats are also provided by senescent plants - eg: hollow trees. For us, senescence is best avoided if we want to have maximum life and production in our system, so we make sure that our actions are the disturbance event that eliminates senescence and triggers a strong growth pulse.

Precise management is the key to getting the best results from syntropic agriculture. The disturbance cycles which naturally occur in nature which revitalises a consortium are mimicked with pruning, except we as managers do it at the right time instead of waiting for a storm etc. This prevents stagnation and senescence, ensuring that everything stays at maximum growth and health.



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