Effect of coppicing on abundance of violets essay

A natural woodland ecosystem contains rich sources of wood such as oak and beech that humans want to exploit.

It contains a stable community of plants, insects and birds. Coppicing is a method of cutting trees near the bottom and allowing them to grow with many branches at the bottom. This is designed to be more efficient for man but allows this climax community to exist as naturally as possible. It could also be proved to benefit wildlife such as increased nesting places for birds.

This cycle has been implanted in the woodlands on Weald clay wild in Sussex. A woodland ecosystem is made up of four layers, starting from the top, canopy, shrubs, herbaceous layer and the ground layer. A lot of the time these intermix and it can be difficult to distinguish. Pale wood violets (viola reichenbachiana) are perennial plants that grow in hedges and banks in areas of deciduous woodland.

Due to its high phenotypic plasticity (grows along hedgerows and woodlands), they are abundant in coppiced areas. Woodland Violet is a low growing plant and can be identified by their pale heart-shaped leaves. The flowers are violet (with dark purple veins). Early Dog Violet are another type of violet which are very hard to distinguish that also grow in woods and shady habitats among the pale wood violets. Violets are sciophytes (shade loving plants), growing under the herbaceous layer.

They flower during March-May. Violets are adapted to these shady conditions by having thin and flat dark leaves. This allows as much sunlight to be absorbed so more photosynthesis takes place. The few layers of cells so that light reaches the chlorenchyma tissue where all the photosynthesising cells

are. The dark leaves show the high amount of packed chloroplast. The rate of photosynthesis depends on many factors:(i) the light intensity(ii) the colour of the light(iii) the amount of CO2 present(iv) temperature(v) the amount of chlorophyll present in the leaf(vi) the amount of available waterAs light intensity is a factor when this increases the rate of photosynthesis increases too.

After researching into shade plants I learnt they have low respiration rates and much lower compensation points (amount of energy produced by photosynthesis is equal to the amount of energy required to carry out metabolic reactions). That means lower light intensity is needed to carry out metabolic reaction than usual. Their leaves are usually larger and rounded, to trap the maximum amount of light. The rate of transpiration is also dependent on the photosynthesis process that is driven by light. As the transpiration rate increases so does the rate of photosynthesis.

The opening and closing of the guard cells (stomata) controls the diffusion of carbon dioxide into the leaf. They are situated between the mesophyll cells that carry out photosynthesis and the atmosphere. As I know from previous knowledge the sunnier the day is the more chance the stomata will be open. More carbon dioxide will diffuse, therefore increasing photosynthesis in the leaf. The rate of transpiration is increased too in order to cool the leaves and as a result water moves up the plant through the xylem quicker to replace lost water. Water, the solvent for all minerals and salts required by cells reaches these places quicker to eventually speeding up all chemical reactions too.

I know photosynthesis is made up of two reactions one is light independent and one light dependent. Light dependent reaction splits water by photolysis and forms ATP (the energy carrier). The process occurs in specialised chloroplasts made up of chlorophyll and carotenoids. They are most efficient in blue/violet and red light and reflect green explaining why leaves are mainly green.

AIMI plan to make a controlled comparison on the abundance of violet growth between a recently coppiced woodland and an older coppiced woodland, relating to the variable light. I predict the 6 year old coppiced land will be more abundant in violets than the 10 year old coppiced land. I can see this in my preliminary study (pg) where the total of violets found in the 10 quadrats of the 93 plot was 100 but the total violets found in the 97 plot was 149. This was significantly more in the 97 plot than in the 93 plot. The 93 plot was also quite abundant in other species like self heal and archangel. Although violets are shade-loving plants they still require light to drive photosynthesis.

As stated earlier, photosynthesis involves two reactions light dependant and light independent. When light intensity increases so do the reactions. Light independent reactions will speed up too because it requires ATP (used in the Calvin cycle), which is synthesised in the light dependant reaction. As more reactions take place growing processes increase too and allow for increased reproduction.

The increased reproduction should show in my data increased abundance. I was told violets grow in bunches around each other so offspring will grow

around parent plant. If I refer back to my preliminary study the 1993 subset had an average light intensity of 3000-4500 lux while the 1997 subset had readings of around 8500 lux. Therefore due to this fact and the earlier knowledge I predict subset 1997 to be more abundant in violets than subset 1993.

Growth depends upon photosynthesis and photosynthesis can only happen when there is light energy. Plants contain a chemical called auxin that is present in the growing areas the shoots and roots. Gibberellins and abscisic acid are growth regulators whose part of the job is to control height. Gibberellins are secreted by starch being mobilised to form maltose. Starch is produced by photosynthesis. Therefore the more light there is, the more photosynthesis there will be, the more auxin and plant hormones are produced, the more growth there will be overall and therefore the quicker the plant can reproduce.

Increase in rates of transpiration caused by sunnier areas and the opening of stomata calls for more water and carbon dioxide in the plant. The more of water and carbon dioxide are required the more photosynthesis will take place. Since and increase in the rate of photosynthesis increases the growth rate of plants, in this case violets, I can expect the sunnier the plot will be the more violets there will be.