5.0 Discuss site quality and other factors affecting tree growth.

5.1 Discuss site quality and means to assess site quality.

There are a lot of factors that can tell us how rich or poor a site is for growing trees. Most farmers in Saskatchewan can quickly tell if a potential farmland is rich or poor, usually by just feeling the soil and coupled with experience. Digging a soil pit in the forest could tell us from a soil perspective (easier for farmers with exposed soils) if the site is rich or not. A look at the vegetation, its diversity, its vigor and its composition is a very good method. The more diverse the vegetation is or the more variety of species that is able to grow on the site; then the richer the site is for growth.

A simple method in forestry is to measure a tree height at a given base age, which is usually 50 years for our province of Saskatchewan. For example, if Site A could produce a 25m tall tree in 50 years, and Site B produces a 20m tall tree in 50 years, then Site A is a richer site – producing an average height growth of 0.5m a year while Site B is producing 0.4m/year. Both of these sites are rich sites (actually anything 0.3m and greater are rich sites), but A is richer and if we invested money in Site A (say for Christmas trees), we would get our money back sooner than in Site B. Richer sites mean that the trees grow faster in height and usually has less taper associate with it.

5.2 Describe leader, terminal buds, lateral buds and apical dominance.

The leader of a tree is the most recent growth on a tree and is at the top of the tree. A tree grows from the top bud upward, and not from out of the ground. In other words, if a sign is nailed on to a tree and the tree grew 30 centimeters that year, then that rail is still at the height that it was originally nailed. A tree's buds usually grow against gravity and towards light. The leader was formed during the last growing season and is usually an indication of site quality or site capability; longer leader lengths equal richer sites.

The terminal bud on a twig is the last bud on a twig and will produce next year's growth. On conifers, the terminal bud will grow straight up in the air, while angiosperms have a little different growth form. The terminal bud usually opens earlier in the spring than the other buds. Lateral buds are buds that are on the sides of a twig and will result in lateral branches (or leaves or flowers) in the next growing season.

Apical dominance is the ability of the terminal bud to grow and stay ahead in growth (and height) when compared to the lateral buds. Conifers show more apical dominance than angiosperms. Some research has shown that there is a growth hormone responsible for apical dominance, and it's stronger in conifers. If the terminal bud is somehow removed the effect goes away, and there will be a fierce competition by the lateral branches to become the leader on the tree. This can result in trees having two or more leaders, which is a very wasteful process from the tree's perspective.

5.3 Discuss taper and live crown length.

Most of us have seen trees grow and know that the tree's diameter gets smaller as we go up the tree. This is known as taper – a decrease in diameter with an increase in height. This feature of taper is what makes building log houses a challenge as well as sawmilling – sawyers are limited to lumber sizes by the size of the top diameter. There are a few factors which influence the amount of taper a tree has, such as branchiness, site capability and environment, genetics, and stocking density. Let's look at the factor that has the most influence on diameter and that is live crown length – which is the amount of the tree covered with foliage that is capable of photosynthesizing. There is a direct correlation between live crown length and tree diameter. Photosynthesis is a tree's means of producing food for itself, so, the more live crown length, - the more food capable of being manufactured and therefore more taper. Live crown length is a numerical number; say 7m on a 10m tall tree. If we had 7m of live crown on a 20m tall tree, there would be quite a difference of live crown. This leads us to live crown ratio – which is a ratio of live crown to total tree height, both expressed in the same units. In the earlier example of a 7m long crown on a 10m tall tree we would have as a live crown percentage:

Live Crown Ratio (LCR) = amount of live crown x 100

Total tree height = 7m x 100 = 70% = 10m

Let's compare this to the second example of a 7m live crown on a 20m tall tree and we have LCR = 7m x 100 = 35% = 20m

Note that both of these had the same amount of live crown, but the second one of 35% LCR would have a lot less taper (less diameter growth) because the same amount of live crown (7m) had to feed a larger tree. Is it possible to have a 100% LCR? Yes, a tree would have branches from the top all the way to the bottom – which usually gives a lot of taper. Most trees function in the ratio of 30% to 75% for live crown ratios. If a tree has a LCR of less than 30%, then there will be little diameter growth (tall and skinny), and if a tree has a LCR of less than 20%, then there will be very little height growth. Not enough food was produced to support height growth.

5.4 Discuss live crown ratio and some of its effects on tree growth.

Live crown ratio is very dependent upon the amount of trees that are growing on a forest site. Density is the amount of trees on a given area. When trees are young, we can have high numbers on a site (say 5000-100,000 per hectare) but as trees mature, the numbers decline sometimes down to 1200-8000 per hectare – usually a function of species and site. The fewer trees on a site, the more space for each tree, and therefore the longer the crown on a tree. If one site had 2000 stems/ha and another site had 5000 stems/ha, then the site that has more stems would also have less space and small crown size. The site that had 2000 stems/ha would have more space to grow and a larger live crown width – meaning that the branches would be longer and resulting in more photosynthetic area to each tree. Live crown width is the width of the crown's longest branches,

which are usually present at the bottom of the live crown. A couple of misunderstandings can occur when discussing live crown length, live crown ratio, and live crown width. When comparing two live crown lengths, we can have the same live crown length, but different live crown ratios because the trees' heights could be different. We can have similar live crown ratios but different live crown length – when we have different tree heights. We can have the same live crown ratio and live crown length and the same tree height but have different taper because the live crown width may be different. The tree that had the wider live crown width would have more taper because it would have larger diameter growth per year. It stands to reason that diameter growth is heavily influenced by the amount of live crown.

One more term associated with taper is a form-class model which talks about the form of a tree. What this does is that it measures a tree at 5m above ground (using an upper stem dendrometer) and it compares it to dbh, using alike units, for example, a tree that had dbh of 50cm measured 40cm at the 5.0m point on a tree. What is the form-class for this tree?

Form-class = height at 5.0m mark = 40cm x 100 = 80%

dbh = 50cm

Answer: 80% form class, or sometimes referred to as an 80 form factor.

Question: Another tree had a dbh of 25cm and a 23cm measurement at the 5.0m mark. What is its form class?

Answer: 23cm x 100 = 92% form class = 25cm

A form class of this high number (92%) would normally be associated with a high site capability because it had very little taper when compared to the previous example of 80%. Lower form classes normally have more taper, higher form classes have less taper. Telephone poles, pilings, log home timbers and many products have certain specifications that can be described with form factors and may be only available through certain forest sites.