Timber Stand Improvement

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Key essential elements of forest management are not being regularly implemented on private land across Australia. Stand improvement and regeneration management needs to be included as a cost recorded against returns from harvest operations. Timber stand improvement is a concept that has been in existence for many centuries and yet as native forests decline in productivity these concepts have been significantly eroded.

The fundamental rule of productive native forest management is to always leave a forest in a condition that allows it to regenerate and improve its productivity over time.

Stage 1.

The first stage of sustainable native forest management can be achieved by optimising individual tree growing space – giving trees enough space to grow. Tree stocking levels i.e. trees/stems per hectare, is dependent upon tree species (type), their diameter (size) and the quality of the site (soil type and depth, rainfall, etc). As a general rule as trees get larger, more space is required to maintain tree health and growth vigour.

Competition between trees is the major influence on forest health, quality and value. The number one message is that "trees need space to grow". This is not to say that competition, at certain stages of a tree's life, is not vitally important. Initial close spacing for a young tree provides mutual protection, encourages the formation of a single leading stem, and restricts the size of branch development. As trees grow up and mature their crowns begin to interact and there is increased competition for sunlight, nutrients and moisture. For a tree to continue growing vigorously, as well as maintaining its health, it must be provided with sufficient space.

By selectively removing the poorer trees on a cyclic basis, the 'superior' healthier retained trees are able to both grow into product sized trees and regenerate the forest. Ideally, as trees reach their optimal value and size for their product type, they are removed through a harvest. By only removing poorer trees, trees that have reached their optimal value, and keeping optimum stocking (re-spacing regeneration), the forest productivity will continue to improve over time.

When these forest production principals are applied along with the required watercourse protection, habitat tree retention and appropriate drainage, the productivity of the forest and its biodiversity values are maintained, or enhanced.

How do we determine the trees to keep? Initially we consider what the timber industry desires, i.e. straight logs, with little defect, reasonable diameter and suitable species. The next thing to consider is what characteristics does a tree need to grow healthy and large. The answer to this question lies in the tree crown. Tree crowns are the single most important factor in determining the future of the tree. Regardless of how straight the trunk is or how much volume there is, if the crown is defective, the timber growth and perhaps even the wood quality will be declining.

So what is a defective crown? There are a number of indicators of a defective tree crown, such as: the number of dead branches, sparse foliage, mistletoe infestations, small branch growth from stress (epicormic shoots) as well as the crown shape. If the tree crown is distorted to only one side due to past competition it can impact upon tree growth potential. (**See figure 2**)

Figure 1. Healthy Crown with conical shape and few dead branches.

Figure2. Unhealthy lopsided crown with many dead branches resulting in extremely poor growth.

How do we determine which trees to keep when all things are equal? The way we decide this is by looking at a thing called "crown placement". Crown placement in simple terms is where an individual tree crown is positioned in relation to the trees that are directly next to it. If the subject tree has its crown above all adjacent trees, it is regarded as "dominant". If the subject tree has a tree crown that is equal in position to all adjacent trees, it is regarded as co-dominant. If the subject tree has a crown that is below all adjacent trees, it is regarded as "suppressed". Ideally in selection we will try to retain only dominant and co-dominant trees as our future forest.

The last issue to be considered is if the tree has reached its optimal value for its log length and diameter. A tree that has been grown as a pole will actually decrease in value if it grows beyond its maximum diameter for any given length. A tree that has a 17.5 m pole that has reached its maximum allowable diameter, will actually loose value as it continues to grow and is unable to be used for a pole. The log may be used as a sawlog or if you are fortunate a girder or sliced veneer billets.

Stage 2

Understorey thinning is an integral aspect of all genuine native forest management. For those who are qualified forestry professionals, post harvest understorey thinning is an essential flow on consequence of a harvest operation and therefore should be regarded as an essential element of a complete harvest operation. In fact, in a true sustainable "forest practice", harvest itself must be regarded as a silvicultural operation that endeavours to leave a forest in a state that has the ability to regenerate and improve in health and productivity perpetually. The desired end state "perpetual improvement", is only possible via thinning of unproductive overstocked regeneration.

Figure 3. Heavily overstocked regenerating forest requiring removal of a high proportion of the stand To achieve optimum growth.

Figure 4. Previously heavily overstocked regenerating forest after timber stand improvement processes reducing stocking rates from 600 to 200 stems per hectare.

Regardless of the species composition of a commercial forest, the regeneration from seed, stump and/or lignotuber will occur after harvest. Unless understorey thinning is allowed to occur, the future forest structure will be determined by unmanaged, suppressed regeneration, lacking in structure, habitat, diversity, health and vigour. (**See figure 3**)

Throughout Australia, private forest after private forest has been high graded for decades. Slowly, through education programs, demonstration and literature many landholders have become aware of the need to thin for the sake of forest health and growth.

There is no such thing as a "non-commercial thin". Whenever this term was developed it failed to recognise the realities of sustainable forest management. Every thinning operation costs money and every thinning operation should result in stand improvement. Thinning is always a commercial decision. It is long been recognised that via the removal of unmerchantable stems, value is being transferred onto the retained adjacent stems. The more desirable term would be "Timber stand improvement". (**See figure 4**)

The term "non-commercial thinning" has resulted in a perception that it is an **optional** silvicultural activity. There is the perception that somehow the forest is being unnecessarily subjected to the removal of trees for no good reason apart from grazing or park like end-state. This incorrect perception undermines 'tree spacing' as the corner stone of forest science.

In fact all over the world: University of British Columbia, UK Forest Products Association, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, Sierra Leone, America, New Zealand, India and many more there is clear understanding and acceptance of the need to perform 'Timber stand improvement'.

Conclusion

Native forest management can be economically, ecologically and socially sustainable when the forest is regarded as primary production with environmental values being appropriately managed. The basics of forest science can be extended to landholders in simple terms, similar to the way graziers manage a herd of cattle i.e. keeping the best, not overstocking and continuously improving. Returning forests back into a productive state will only be achieved by returning our thinking back to forest management basics i.e. "Timber Stand Improvement".