CHAPTER 5

Conclusion

5.1 Tree size and survival after a fire

Older trees survived better (more than 2 times) after a fire comparing to younger trees. Small differences of survival percentages were detected between each monitoring in the older plots, but there was a dramatic gap found in younger plots. It is assumed that younger trees faced with cambium injury after burning, and therefore died within weeks. More attention had been paid to small trees with DBH <40 mm because they were more vulnerable to a fire (about 50% chance of dying).

From all analyses done in this study, it has been confirmed that trees with bigger stems survived significantly better than small ones do. A higher chance of survival in bigger trees are probably due to the development of protection, such as bark and stem thickness that positively correspond with stem diameter. Larger trees tend to have thicker bark to protect vascular cambium tissue from fire which can cause tree mortality via stem necrosis and deformation.

When considering each plot separately, the relationship between stem size and survival after a fire has become less clear due to influences of other factors, such as the fire’s intensity, duration of burning, and surrounding conditions which are not mainly focused in this study. Moreover, successional status or life history of different species could also contribute to the level of sensitivity to fire disturbance. For planted trees in a restoration program to survive a fire disturbance, fire prevention should be emphasized until the trees reach a minimum of 40 mm DBH.

5.2 Tree size and resprouting after a fire

Smaller trees produced a higher number of resprouting shoots after burning compared to larger trees. This trend was observed in trees with DBH < 90 mm, but the number was fluctuated in trees with DBH 90-210 mm. Very few resprouting shoots produced if the trees' DBH was bigger than 210 mm.

When considering all plots which contained a broad range of different tree sizes, the resprouting ability was found to decrease in bigger trees. It has been mentioned in the previous chapter that there was a positive correlation between stem diameter and bark thickness. Although thick bark can protect buds from burning; however, it also inhibits resprouting via obstructing epicormic bud emergence. Most trees found in the old plots are large and produced very few resprouting shoots after the fire. This might be correlated with bud senescence in the adult stage, which is a result from a combination of genetic, physiological and related anatomical changes.

In contrary, when considering small trees with a DBH < 60 mm, the trees with larger stems within this size class produced a higher number of resprouting shoots after a fire. Bigger stems are associated with resource storage and therefore help the trees to resprout efficiently. Resprouting ability is controlled by the interaction of the disturbance regime that harm buds and resource needed for resprouting, and the environment that affect growth and resource allocation.

5.3 Suitable tree species for restoring montane forest

From this study, all 12 species should be targeted for forest restoration in montane forest ecosystem in northern Thailand. They have a high potential to capture the site, increase species richness and also withstand fire disturbance. According to the suitability index, three species were categorized as excellent species; they were *M. garrettii*, *B. javanica* and *F. auriculata.* Seven species were grouped in the acceptable class; *F. hispida*, *H. trijuca*, *P. cerasoides*, *C. tribuloides*, *P. serratum*, *S. arboreum* and *H. dulcis.* The last three species were identified in the marginal group; they were *F. collosa*, *P. cerasoides,* and *C. longipetiolatum.*

Nine out of 12 species have been identified as potential framework tree species for restoring montane forests in northern Thailand, except *P. serratum*, *F. collosa*, and *C. longipetiolatum.* One big barrier for forest restoration is an understanding about native species particularly phenology, seed biology, and silviculture. The reason why these three species have not been included in the list of potential framework tree species is possibly because of not having seedling available. Their survival percentages are acceptable but not many reprouting shoots produced and growth was quite slow *(*only *C. longipetiolatum).*

Interestingly, *P. cerasoides* was classified into 2 groups, acceptable and marginal, because this species was tested for 2 consecutive years. Clearly, older *P. cerasoides*' seedlings *(*2 years old*)* performed better in selected criteria compared to those younger seedlings *(*one year old*)* due to better bud protection and resource storage.

Although restoration practitioners select target species with a high fire resilient ability; however, a fire prevention program should still be designed with stakeholders, to prevent unnecessary lost throughout the landscape, and direct successional pathway toward an ultimate restoration goal.

5.4 Suggested further research

Following the effect of stem diameter on survival and resprouting probability, stem size may not only be one factor that affects both survival and resprouting. Other stem traits recommended for further study included bark thickness, bark moisture content and density, bud location, structure of meristem and resources allocation.

Furthermore, fire intensity, heat duration, microclimate of ecosystem, plant life history and successional type of the plant would have an effect on the fire resilience characteristic. Therefore, these factors should be considered for further study.