

## **Joint Ecology Working Group Front Range Fuels Roundtable –Colorado Bark Beetle Cooperative**

### **Summary of Lodgepole Pine Fire Behavior**

Fire Behavior in Lodgepole Pine Forests (without epidemic mountain pine beetle populations)

- The natural fire regime of lodgepole pine stands involves infrequent but intense stand-replacing fire, occurring on average every 100-300+ years.
- Lodgepole pine forests always have plenty of fuel to carry high-intensity fires even without mountain pine beetle infestations, windfall or other disturbances.
- Because high-elevation lodgepole stands are usually cool and moist, it is difficult for fires to ignite and spread in live fuels. Thus, fire risk (probability of ignition) is low.
- However, fires in lodgepole pine tend to be intense and to spread through the canopy once ignited, because such fires usually occur under hot and dry weather conditions. Thus, fire hazard (the severity and effects of fire) is high.
- Lodgepole pines are adapted to a high-intensity, stand-replacing fire regime. Though most trees are killed by fire, serotinous (fire-adapted) cones in tree canopies release large numbers of seeds immediately following a fire, and stands regenerate rapidly. This occurred following the Yellowstone fires of 1988.
- Under natural conditions, most fires in lodgepole pine forests are caused by lightning. However, during the past 150 years as human land use and development have expanded into higher elevations, fires have increasingly been started by humans.
- Establishment of a crown fire is predominantly a function of climatic conditions rather than forest fuels: a fire has a greater probability of becoming established in a lodgepole pine stand if weather conditions are hot and dry than if conditions are cool and moist, which impedes fire spread even with high fuel loadings.

### **Fire and Mountain Pine Beetle in Lodgepole Pine Stands in Colorado**

The potential interaction between fire and large-scale mountain pine beetle infestation is unknown, because a mountain pine beetle event on this scale has not been observed in recorded history (a relatively short time compared to the lifespan of a lodgepole pine forest). Current predictions are based on events that have occurred during the last century. Research is underway in Colorado to improve our understanding of the dynamics between fire and mountain pine beetle in lodgepole pine forests, expanding on what we already know:

- When mountain pine beetles kill a tree, the needles dry out and turn red. The dry needles stay on the trees for several years, and during this ‘red stage’ scientists think that if there is an ignition, fire may spread more easily through the crowns due to decreased moisture content in the trees’ needles.
- Once the needles have fallen, fire may be less likely to spread through the bare canopies. Fire hazard may be reduced for some years during this ‘grey stage’ due to the absence of canopy fuels.
- Once the dead trees have fallen, accumulation of large fuels may contribute to intense surface fires (rather than canopy fires) if an ignition occurs. Such fires may be very damaging to soils and emerging seedlings.
- Scientists are investigating whether weather and climate will continue to be the main drivers of fire probability, behavior, and effects in lodgepole forests, regardless of the beetle-caused changes in fuels.
- Some scientists also emphasize that the effects of the beetle outbreak are surprisingly patchy within stands.

Considerable numbers of young trees remain alive in many stands, even though the larger canopy trees have been killed, and these young trees may grow quickly to become the future forest.