

Intensity, Frequency, and Seasonality of Prescribed Burning to Control Survival and Growth of Red Maple

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Overview:

- Red maple (*Acer rubrum* L.) is a shade tolerant species in the Central Hardwood Region of the eastern United States. Red maple is found across a wide range of environments from valleys to ridgetops, and in open and closed forest canopy conditions. Red maple sprouts with rapid height growth after natural or anthropogenic disturbance.
- The use of prescribed fire to control red maple in different seasons of the year has had mixed results.
- A research plantation of red maple was established to determine how the season of burning, fire intensity, and frequency of fire impacts red maple seedling survival and growth.
- Prescribed fires during the late winter season increased red maple sprouting and fires during the spring and summer season reduced sprouting.
- The diameter of the root collars and height of sprouts after late winter fires were generally larger than after fires in the spring and summer seasons.

Summary:

Management problem: Red maple was once a minor component of eastern deciduous forests. It is now the most abundant and widespread tree species in the eastern United States (Oswalt et al. 2019). The increase in red maple is attributed to its adaptability to a wide range of environments and the current management policy of forest fire suppression (Abrams 1992). On most sites, red maple seedlings tend to outgrow the regeneration of more desirable species, especially oaks.

Management need: Managers seeking to reintroduce fire to the natural landscape have had mixed results in controlling shade tolerant species including red maple. Fire has variable effects in different seasons. Single burns produce different effects from multiple burns in the same forest. A greater understanding of fire intensity, seasonality, and frequency of burning is necessary to achieve management goals to reduce understory competition.

Research purpose: The purpose of this research was to determine the effects of prescribed burning on red maple seedling survival and sprouting. A plantation was established to

provide uniform site conditions for research at the University of Tennessee Forest AgResearch and Education Center in Morgan County, Tennessee. A randomized complete block design was used to explore different combinations of fire intensity (high and low amounts of forest fuels), season of burning (three different seasons), and frequency of fire (single fires in alternate years).

Silvicultural Concepts:

- Natural fires serve an ecological role in the development of oak forests of the Central Hardwood Region. Fire suppression programs have interrupted the historic cycle of fire. The reintroduction of fire on the landscape has given variable results to increase oak regeneration and to reduce red maple competition.
- Fires during the late winter caused red maple to sprout profusely. This may be because nutrient reserves are higher in the dormant season. Fire causes less damage at that time as there is no immediate impact to vegetative structures or physiological functions of actively growing seedlings.
- Red maple sprouts that were burned in the winter had a larger basal diameter and height than seedlings burned in the spring or summer season. Seedlings burned during the late winter season produced a greater number of sprouts (fig. 1).
- Increased sprouting capacity prior to spring emergence mitigates stem loss due to fire. The emergence of red maple sprouts early in the growing season creates intense, interspecific competition with the sprouts from other more desirable hardwood species.

Management Applications:

- Ed Yost, Natural Resources graduate student: “The timing of prescribed fires has different effects on hardwood trees. My research revealed that dormant season burns did not reduce red maple sprouting as much as growing season burns (fig. 2).”
- Many trees sprout after disturbance by fire. Tift and Fajven (1999) suggested that red maple produces coppice sprouts and grows rapidly in response to increased sunlight in canopy openings.
- Red maple responds to disturbance and damage by lateral stem growth. The tendency for red maple to bush allows it to rapidly regain photosynthetic capacity after stem loss.
- Prescribed burning during the dormant season to achieve understory removal of red maple may require additional silvicultural treatment such as manual cutting or herbicide application.
- Forest management prescriptions to discourage red maple should include options for burning when red maple is actively growing to achieve desired results.

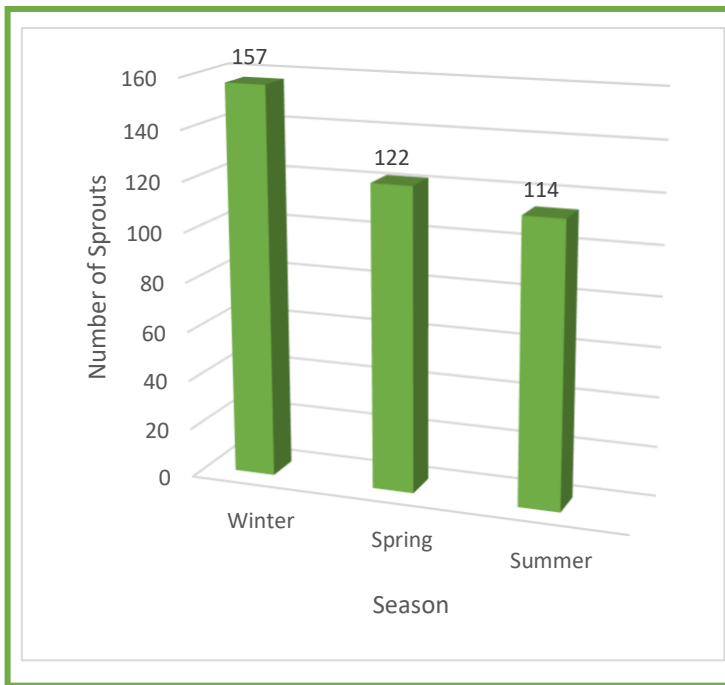


Figure 1—Number of red maple sprouts in plots that were burned biennially by season of burning.



Figure 2—Red maple seedlings during growing season burn with MicroEpsilon ThermoImager to record fire temperatures.

References

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