VMRC: Investigating the Best Methods for Plantation Establishment Since 1993

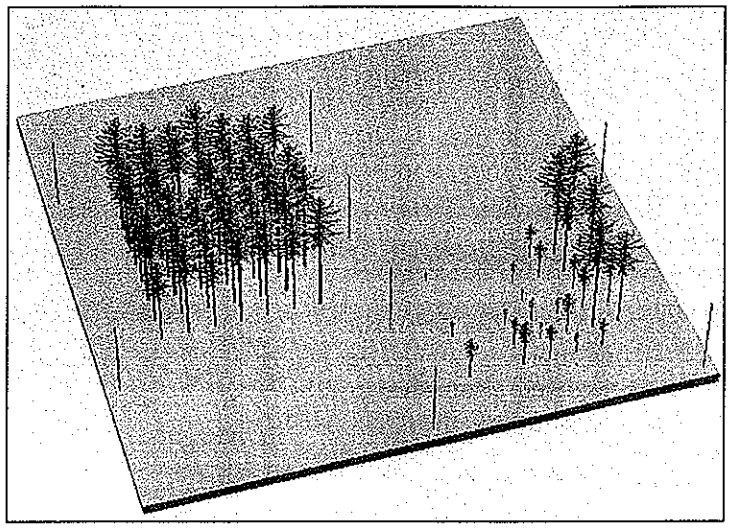
BY ERIC DINGER

The Vegetation Management Research Cooperative (VMRC) has a dedicated group of professionals who work together to explore how plant competition for limited site resources impacts forest stand development. Our mission and primary goals were established to create sound silvicultural systems enabling the successful establishment of forest plantations that exceed legal reforestation requirements. This singular focus has governed the research program for the last 17 years balancing the practical needs of operational forest managers with the academic rigors of defensible science. Throughout this time, research results have helped to answer some of the important questions regarding vegetation management in the Pacific Northwest and produced 19 peer-reviewed publications and five graduate theses.

Ideas for research projects are driven by cooperative members and anyone in the VMRC is welcome to submit a one-page research proposal. VMRC staff at Oregon State University work with this member to develop the idea into a clear plan, which includes hypothesis testing, methods, statistics and budgetary costs. Once complete, this draft work plan is sent to all cooperative members for majority approval. The approved projects are then set up on cooperator lands. Currently, the VMRC is managing five research projects with 12 sites among them occurring primarily in Oregon and Washington. Generally, studies are managed for at least 15 years in an attempt to understand the longer-term impacts of vegetation management on stand development.

Herb I is the oldest VMRC study and its primary objective was to understand the area of tree-centered vegetation control necessary to maximize seedling growth. After only two years of herbicide treatment, increasing the area of control from one to five feet around each seedling has improved year-15 mean tree volume from 127 to 182 cubic decimeters. This represents a 143 percent increase in volume that still exists 13 years after herbicide treatments have ceased. The Stand Visualization System has helped to illustrate the impact these treatments can have on forest development (see Figure 1, an image of two plots that occur on the Summit, Ore., site). After the seedlings were planted, the plot on the left received two years of five foot tree-centered vegetation control whereas the adjacent plot on the right had none. The differences are impressive.

Figure 1: Two plots on the Herb I Summit site after 15 years of development. The plot on the left had two years of five foot tree-centered vegetation control and has a total volume of 8.2 m^3. Seedlings in the plot on the right received no vegetation control and have a total volume of 0.8 cubic meters (m^3).



The Critical Period Threshold study was designed to ascertain the number of consecutive years of vegetation control necessary to maximize Douglas-fir growth (up to five). This study was remeasured during the winter of 2008/09, providing the year-8 results. On the Sweet Home site, one year of vegetation control has produced year-8 volumes of 15.5 cubic decimeters (dm^3), but controlling vegetation for three or more years increased tree volume to over 40 dm^3 (see Figure 2). Analysis of this data suggests that three years of vegetation control were required to maximize Douglas-fir seedling growth on this site. While additional years of vegetation control did increase growth beyond 40 dm^3, the amount of improvement was not enough to be statistically significant.

In an operational context, vegetation is controlled through the use of herbicides in fall site preparation and spring release treatments. These regimes are applied to minimize the competition for limited site resources such as soil moisture and improve seedling growth. A study plan was developed to evaluate how common herbaceous vegetation control regimes, spanning a range of management intensities, impact the growing conditions seedlings experience. It was discovered that when competing vegetation was reduced below 20 percent, soil moisture and predawn xylem water potential (a measure of seedling stress) did not decline to levels that inhibited seedling growth at any point

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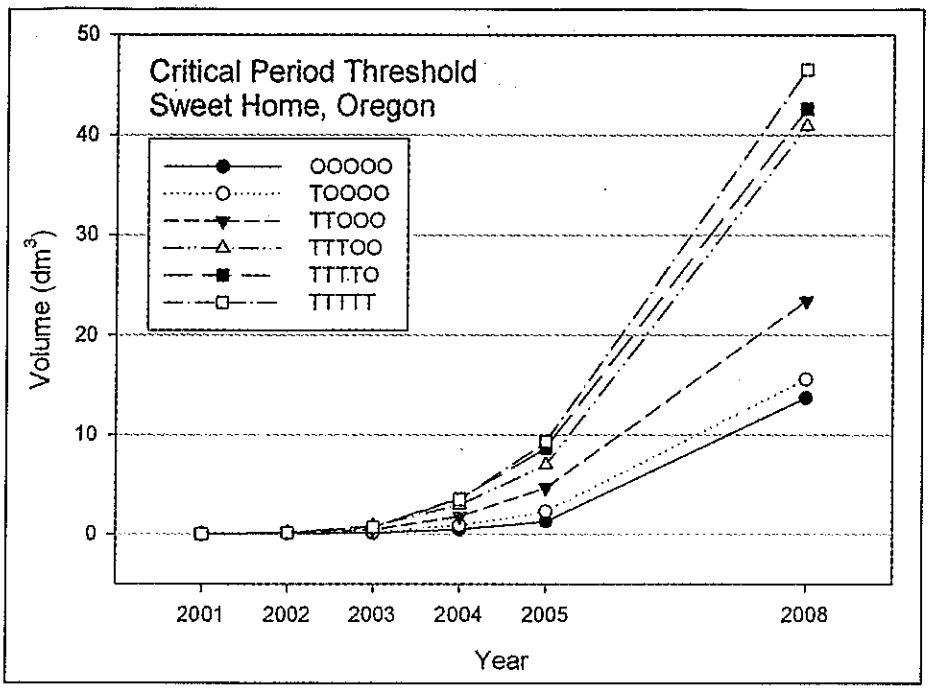
Figure 2: Mean tree volume by treatment at the Sweet Home Critical Period Threshold site. Treatments were applied over the course of the first five years of establishment. "O" indicates that no vegetation control was done during that season while a "T" represents the application of herbicides during that year.



in the growing season (see Figure 3). Maintaining these low levels of vegetation competition for the first two years of establishment produced year-3 mean seedling volumes of 1,253 cubic centimeters (cm^3). When compared to the no-action control, which had a mean seedling volume of 247 cm^3, this response represented a 500 percent increase in growth.

Foresters may choose to hold over a late-harvested unit, delaying the establishment of the next stand one year in order to obtain better vegetation control. The challenge with this management approach is that the next stand is missing one year of growth and may not be able to take advantage of the lower amounts of vegetation that often result from harvesting operations. A side-by-side comparison was set up in 2007 to test this management strategy and the growth of seedlings planted over the course of two years.

The newest VMRC study was set up this past winter near Belfair, Wash., and is looking at the combined effect of various levels of vegetation control on different stocktypes of container-grown seedlings. The valid economic comparisons between the cost of different stocktypes and their growth response to levels of vegetation control will be made possible through this study. Is it better to spend money on a larger seedling or on more intense vegetation control? Does it take both?

As these new studies grow and the older studies mature, the VMRC will continue providing research results that help foresters make sound vegetation management decisions. It is hoped that this information will provide some of the necessary tools that enable foresters to successfully establish plantations, which provide the economic foundation for their companies as well as the communities that depend on the forest industry. For more information about the VMRC, visit www.cof.orst.edu/coops/vmrc/home.htm. ◆

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Figure 3: Soil moisture and seedling predawn xylem water potential results during the initial season of plantation establishment (2006). The no-action control (-/-) had vegetation cover >85% which decreased soil moisture and seedling xylem water potential. Treatments 4, 5 and 6 decreased vegetation cover below 20% retaining higher amounts of soil moisture and high xylem water potential across the growing season. Treatment regimes were applied as a fall site preparation (F) in 2005, spring releases (S) in 2006/07, and follow-up directed glyphosate releases (G) in 2006/07.