SILVICULTURE

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Sylvan—A Stand Structure Model for Examining Forest Stand Dynamics

David Larsen[a,b]

The Sylvan model is designed to allow the exploration of forest stand dynamics with permanent plots or stand simulations. The user interface is designed to encourage user interactions with the objective of conveying the most information about each tree possible. This is accomplished through a series of tools that allow examination of trees individually, in a variety of groupings, or for the whole sample plot. Sylvan tool suite is written in a cross-platform environment (Linux, Windows, and MacOS) with the ability to collect, process, and display forest data in many novel ways. It is built with a profession stable data structure that stores data in SQL databases, and can export data to a comma delimited format suitable for Excel, formats suitable for import into the R statistical package and shape files format suitable for ArcGIS. The software allows the forester to interact with the trees in a way that is similar to marking trees in the woods. It will allow the forester to try the "what if" scenarios and be able to determine the consequences of those decisions. The people working on this version of the software are all trained foresters as well as programmers. For more information or to get the free software, go to the Sylvan website (http://oak.snr.missouri.edu/sylvan/).

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Compatibility and Benefits of Exponential Fertilization and Mycorrhizal Inoculation

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Exponential fertilization and mycorrhizal inoculation of tree seedlings have separately been promoted to improve seedling vigor and establishment. We investigated the compatibility and benefits of combining these two treatments for a commonly outplanted native tree species in Hawaii, *Acacia koa*. In the nursery, mycorrhizal seedlings were larger and had greater nutrient uptake under optimal levels of exponential fertilization. After outplanting, these seedlings had greater survival and growth after 1–2 years under harsh field conditions, namely pasture grass competition, prolonged drought, and night-time freezing temperatures. A controlled seedling-grass competition experiment suggested water stress is the dominant limitation for seedling establishment, while grass competition in the absence of water stress can limit root development and, to a lesser extent, nutrient uptake. Under these controlled conditions, exponentially fertilized seedlings had a much greater capacity to respond to removal of water limitation or grass competition. Given these results, the combination of exponential fertilization and mycorrhizal inoculation are highly recommended for nursery-grown seedlings. These treatments produce larger, more vigorous seedlings that perform better under harsh field conditions and that have a greater capacity to respond to removal of competition or resource limitation.

Video of this presentation can be viewed at http://vimeo.com/83313423.

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Modifying Regeneration Estimates in FVS with REGEN

Chad Keyser[a,b] and Tara Keyser[c]

Eastern and Southern variants of FVS provide rough estimates of regeneration following significant disturbance events. Regeneration response is based on the growth of advanced regeneration, sprouting, and the inclusion of user-specified natural and planted seedlings. The dynamic interaction of these regeneration sources with site conditions is difficult to model in FVS, although local experts may be able to manually adjust FVS adequately. It was our desire to automate the adjustments. REGEN is an expert system designed to predict the codominant and dominant trees at crown closure based on each regeneration source's ability to compete on a given site. R was used as a parent model to alter the FVS regeneration dynamic based on REGEN outputs. This model has been used to successfully model regeneration dynamics following significant disturbances for inventory plots throughout the Southern Blue Ridge Mountains.

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Integrating Understory Herbaceous Plants into Forest Management

James Chamberlain[a,b]

In much of the Appalachian hardwood forests, the biological diversity from forest floor to breast height is greater than above breast height. Long before people had the technology to harvest trees for timber, they were gathering forest herbs for food, medicine and other sundries, for personal consumption, and to generate much needed income. This use of the forest understory continues today, with little or no management efforts. The forestry profession is supported by over 100 years of science-based knowledge on managing and growing trees, but it has very little information on managing herbaceous species. This presentation focuses on the ecological impact and implications of harvesting nontimber forest products on the forest ecology. It concentrates on three native herbaceous species: *Panax quinequifolius* (American ginseng), *Actaea racemosa* (black cohosh), and *Allium tricoccum* (ramps). The presentation examines the relationship of ginseng harvest to forest stand conditions to provide a means to focus conservation efforts for this medicinal forest product. Results of long-term studies of black cohosh are presented that illustrate the level of harvest that is unsustainable, as well as the relationship between forest canopy cover and plant growth. Changes in ramp populations, documented through long-term studies of sites that experience significant harvesting events are presented. The relationship between tree canopy development and the development of ramps is analyzed to illustrate the timing of harvest to ensure optimal biomass production. These examples set the stage for a discussion on the need to expand forest management to include the herbaceous plants in the understory.

Video of this presentation can be viewed at http://vimeo.com/83314189.

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