

Agricultural science research is a global investment in protecting the future of our state. Agriculture in New Mexico accounts for approximately \$4 billion in direct sales and 42,000 jobs. Challenges to growers and ranchers are constant and evolving. Invasive pests, a decline in species diversity, pollinator health, resistance to pesticides, and limited water are needs that are being addressed by New Mexico State University's Agricultural Sciences Centers. The wide diversity of both growing conditions and cultures means solutions must be developed locally in conditions that reflect those faced by New Mexicans.



JTH FORESTRY RESEARCH CENTER

The John T. Harrington Forestry Research Center (JTH FRC) was established in 1972 to address state and regional issues related to forest regeneration after timber harvesting and forest fires. It is the only research program in the southwestern US that focuses on forest nursery technologies, tree improvement, and ecophysiology of young forest trees to facilitate ecological restoration and /or commercial reforestation. The research conducted at the JTH FRC is critical for sustainable forests in the region.

UNDERSTANDING THE NEED FOR RESEARCH

Since the inception of the JTH FRC, forest health in New Mexico and the entire southwestern US has continued to decline due to a combination of factors that include historic fire suppression, increased fuel densities, increased drought, and a lack of proper forest management. As a result of these factors, forests of the southwestern US have been burning at catastrophic levels, especially in recent years. The effects of these fires influence downstream water sources (municipal and agricultural), forest-stocking levels, wildlife habitat, and many other critical resources. Reforestation of these severely burned forest lands is not commonly practiced in the southwest primarily due to a lack of knowledge and resources. For those areas that have been reforested, there has been little success with an average of only 20% survival of planted seedlings. It is critical to promote applied research that will address these forest health concerns including forest restoration and reforestation.



HISTORY OF RESEARCH

The JTH FRC research effort has evolved since the start of the program in 1972 that originally focused on tree improvement for commercial tree value to one that now focuses on restoration via tree planting after large catastrophic fires. Over the last 15 years, the JTH FRC has developed the only research program in the southwestern US that focuses on forest nursery technologies, tree improvement, and ecophysiology of young forest trees to facilitate ecological restoration. One example of current and first-of-its-kind research is the drought conditioning research program that began in 2014 in partnership with the US Forest Service and New Mexico Highlands University. This research has shown that reductions in the amount of irrigation during the nursery growth phase will result in alterations in seedling hydraulics. These changes increase both seedling survival and growth in post-fire environments.

Many organizations across the southwestern region rely on the JTH FRC for expertise in designing forest restoration projects and implementing forest planting projects. These organizations include the US Forest Service, National Park Service, The Nature Conservancy, Northern Arizona University, Utah State University, NM State Forestry, Santa Clara Pueblo, Philmont Boy Scout Ranch, and many others. Additionally, the JTH FRC is the largest producer of tree seedlings in the southwestern US with a capacity of 300,000 per year, which supplies seedlings to most of the organizations listed above for both research and operational plantings.

ACES Pillars for Economic and Community Development

Food and Fiber Production and Marketing
Water Use and Conservation
Family Development and Health of New Mexicans
Environmental Stewardship

Foundational Education and Training

RESEARCH IMPACTS:

- Seed transfer guidelines for *Pinus Ponderosa* in the southwestern US have been, until recently based solely on geographical regions. This creates a serious risk for out-planted seedlings to be maladapted to the planting environment. The JTH FRC, in collaboration with the US Forest Service, has developed new seed transfer guidelines that incorporate genetics, morphology, physiology, and climate to accurately define placement of seedlings to maximize survival and growth while limiting issues with insects and diseases. These new seed zones will be used by both public and private organizations involved in reforestation and restoration projects.
- Research examining drought conditioning of *Populus tremuloides* and *Pinus ponderosa* during the nursery growth phase has shown significant success. In the JTH FRC nursery, seedlings responded to irrigation limitations with improved plant hydraulics and photosynthetic rates. These conditioned seedlings were out-planted into dry, harsh field sites and monitored for performance. Preliminary results show that drought-conditioned seedlings had both higher growth and survival rates compared to operational standards. These results have already started discussions with nursery and forest managers on using this new approach.
- In fall 2017, the Forestry Research Lab (FRL) was established as a collaborative program between the Department of Natural Resources Management (NRM) at New Mexico Highlands University (NMHU) and the JTH FRC at New Mexico State University. Through continued research, the FRL will work to restore proper ecological function to forest landscapes throughout the Southwest. Additionally, the FRL will serve as an educational platform for both classroom activities as well as research opportunities for both undergraduate- and graduate-level students at NMHU and NMSU.

UNIQUE CHARACTERISTICS

- The JTH FRC is extremely unique not only for NMSU but also across all universities throughout the southwestern US. The JTH FRC is the only research program in the southwestern US that focuses on forest nursery technologies, tree improvement, and ecophysiology of young forest trees to facilitate ecological restoration. These research interests are critical for restoring forests in the region.
- The JTH FRC is the largest producer of forest seedlings in the southwestern US with a current capacity of 300,000 per year. These trees are primarily used to restore disturbed forests after severe forest fires and mining operations within the state. Additionally, portions of these seedlings are distributed to the general public through New Mexico's State Forestry Conservation Seedling Program. Funds generated from this program cover all costs for production as well as support additional research projects



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