IN THE SPOTLIGHT: DR. DEREK YOUNG

Seeing the Forest and the Trees

Field work in California's forests offers Derek Young an escape from the heat of the Central Valley in summer.

DR. DEREK YOUNG is a postdoctoral researcher in the Latimer Lab at UC Davis, where he works on understanding the relationships between climate change, disturbance, and restoration in California's forestlands.

California's forests both affect humanity — by providing oxygen, storing carbon, and filtering water — and can be affected *by* humanity through use, overuse, degradation, and management. On top of that, climate change and disturbances like wildfires and droughts not only impact forest health, but also influence the decisions forest managers make to keep forests healthy.

Dealing with Density

"Given a century of fire suppression in the western US, many forests have become unnaturally dense, increasing their susceptibility to drought," says Dr. Young. As more trees (and understory shrubs) occupy the same space, they compete for the same water resources, making them more vulnerable when those resources are limited. Once the trees are drought stressed, it is easier for forest pests like bark beetles to decimate entire forest stands. High-density forests are also more susceptible to high-intensity wildfires that can kill the majority of trees across broad areas of forests.

Derek and his colleagues work on identifying solutions to these density-related problems — what can forest managers do to improve the resiliency of today's forests, and how should forests be replanted *after* a mortality event to best support future forest health — and assessing the success of different management practices like mechanical thinning or prescribed fires for reducing forest density. In fact, Dr. Young and colleagues recently showed that the effects of thinning can persist even after a thinned stand experiences a die-off, and that as those thinned stands regenerate, they are more likely to regenerate with ecologically-beneficial hardwood trees at a greater rate, underscoring the potential long-term benefits of thinning.

A Climate-Wise Reforestation Toolkit

Along with their partners, the USDA California Climate Hub developed a **Climate-Wise Reforestation Toolkit** that can be used to inform reforestation decisions with climate change in mind. The toolkit's three tools can help land managers to identify priority areas for reforestation, understand current stand conditions in the aftermath of the drought, and develop a reforestation planting guide based on known best management practices.

Saving Time and Money in Post-Fire Restoration

According to Dr. Young, in the absence of management practices that improve the resilience of standing forests and effectively reforest those stands that have experienced widespread mortality, "our forests as we know them will gradually disappear." While thinning forests can improve forest health and lower the risk of high-severity fires, for those areas burned by high-severity fire, active reforestation is important to ensuring that the land returns to forest rather than regenerating solely as shrublands. Because reforestation is so expensive, Dr. Young and his colleagues work to identify specific sites where forests are most likely to recover, and consider future stressors like climate change, to help focus forest managers' efforts and ensure that the time and funds spent on reforestation will have the greatest impact.

The Future is Now: Artificial Intelligence in Forest Restoration

When asked about the future of forest restoration, Dr. Young shares the growing role of artificial intelligence, or AI, in collecting and analyzing data from vast tracts of forestlands. "Lately we have been embracing the potential of drones and AI computer vision for collecting data from forests across areas much broader than we are able to survey using ground-based field plots." Beyond data collection, Dr. Young notes that well-trained AI programs have the capacity to detect patterns of density, forest structure, or change in forested landscapes at a much more refined scale and much more efficiently than relying on time consuming field surveys alone. "One example of an area that could greatly benefit from this," Derek says, "is the detection of early warning signs of future forest mortality. If we can identify the most stressed forests early on, we can step in with interventions before it's too late."

A drone photograph of a fire severity boundary on the 2014 Eiler Fire on the Lassen National Forest. Courtesy D. Young

Learn more about Derek's work here!

The California Climate Hub will occasionally spotlight our collaborators or impactful research projects relevant to California agriculture, forestry, and rangelands. If you know of a researcher, resource manager, producer, or project that should be highlighted, please let us know. For recommendations or more information, contact Lauren Parker at leparker@ucdavis.edu