Improving restoration success through seed enhancement technologies

Mrs. Olga Kildisheva[1,2,3], Dr. Todd Erickson[1,2], Dr Matthew Madsen[4], Professor Kingsley Dixon[5], Dr. David Merritt[2]

[1]University Of Western Australia, [2]Kings Park Botanic Garden, [3]Chicago Botanic Garden, [4]Brigham Young University, [5]Curtin University

The Pilbara Bioregion of Australia's north-western arid zone, is one of the most biodiverse deserts of the world and is now becoming increasingly threatened as a result of expanding mining activities in the region. Government regulations require that ecological restoration efforts reinstate pre-mining species composition, diversity, and cover following mine closure. However, challenges associated with plant reestablishment on highly degraded sites and the scale at which such restoration must take place, present substantial barriers to system recovery. The lack of scientific and technical knowledge associated with seed dormancy, germination traits, and seedling ecophysiological requirements are responsible for the failure to meet plant establishment targets.

More than 70% of Pilbara species produce seed that exhibit dormancy, which can lead to establishment failure if dormancy is not properly managed prior to, or directly following seeding. Identifying specific dormancy mechanisms and alleviating dormancy prior to sowing can significantly increase the likelihood of seedling establishment. Large-scale restoration in harsh, altered environments requires the use of novel approaches to overcome site limitations to plant establishment. Seed enhancement technologies, or techniques applied to seed post-harvest, can be designed to address site-, species-, and time-specific limitations to plant germination and establishment. For difficult to germinate species, combining dormancy alleviation treatments with seed enhancement technologies to produce "restoration-ready" seed has the potential to further increase seed-use efficiency. In a series of studies, we evaluate the potential of combining dormancy alleviation techniques through the use of plant growth regulators) with seed enhancement (i.e. hydropriming) in order to improve germination and emergence predictability and plant survival. These findings aim to demonstrate the potential of improving the capacity and outcome success of large-scale, seed-based restoration in the context of dryland, post-mining rehabilitation.