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Seed germination beyond child's play

It's just another day at the office for research assistant, Stephanie Koontz, as she heads out of the research buildings at Archbold Biological Station to work with some of the rarest plant species in Florida. "A favorite childhood memory of mine is removing the seeds of an apple core, placing them on a wet paper towel and watching them emerge over the next few days." But, she adds, "If only germination was this easy with seeds of rare plants. Finding the right conditions for a seed to germinate and then helping that seedling survive to adulthood can be a bigger challenge than one might imagine."

Together with the rest of the research team in the Plant Ecology program, Koontz does lots of germination experiments on native plant species found only on the Lake Wales Ridge, the ancient sandy ridge that runs north to south through Highlands County. She explains, "Many of our experiments focus on precisely what conditions are needed for the seeds of a particular plant species to germinate and grow." Scientist at Archbold and at other research institutions have found some seeds require scarification to germinate, which is the wearing down or breaking of the hard seed coat protecting the seed. Once the seed coat is breached, water can be absorbed and the seed may germinate. Other seeds require particular weather conditions such as the cooler temperatures of winter and spring. A unique trait of some seeds found on the Lake Wales Ridge is a response to fire, a natural disturbance in Florida ecosystems. Fire can scarify the hard seed coat or chemical cues from smoke can trigger

germination of seeds. “One reason this response might benefit the plant” explains program director Dr. Eric Menges, “is that, after a fire, most competing ground plants are burned off, so there are few competitors for a little seedling. The positive effect of fire on subsequent seed germination is ubiquitous in fire-dominated ecosystems around the world.”

One rare species, however, that continues to baffle scientist of the Plant Ecology Program is Lewton’s Milkwort (*Polygala lewtonii*). “This small spring-flowering, long-lived herb is found only in the sandy soils of central Florida,” explains Koontz. “It’s a fascinating plant, with three types of flowers and seeds that are dispersed by ants. But its seed dynamics have been a persistent puzzle.” Lewton’s Milkwort is one of many very rare, federally threatened plants found in sand habitats in Highlands and Polk County. Considerable scientific effort has been made to work out how to best manage for this plant, and allow its populations to recover to safe numbers. Archbold’s plant research team has followed responses of protected populations of this milkwort after four prescribed fires, deliberately set to improve habitat, at a natural site near Sebring. Koontz explains that, “After each fire, the number of new seedlings of Lewton’s Milkwort explodes at this site. In unburned plots, we typically see 1 to 3 seedlings in each meter squared but in burned plots, that number jumps to 6-81 seedlings in the same area! Based on these results, it seems like fire is a strong germination cue for seeds of Lewton’s Milkwort.” Identifying how fire triggers germination in Lewton’s Milkwort has been an ongoing research question for years.

Archbold’s plant research team has done many germination experiments on seeds of this milkwort. Koontz noted, “We have stored seeds, and buried seeds, and grown them in different seasons. We have exposed seeds to smoke, heated seeds in an oven, and burned over seeds buried in sand. We have scarified and soaked seeds in water or smoke water. Our success has ranged from 0-61% germination and results have not been as consistent as we would have hoped.” She adds, “While frustrating, this is also the exciting part of science; we never give up trying to solve the puzzle.” Over the years, there has been success. Germination has been highest when using stored one-year-old seeds, sowing seeds during spring temperatures, and after exposing seeds to smoke. Through all of these experiments the overall goal remains the same; gain a better understanding of the seed ecology of this rare plant to improve management by using the appropriate timing and intensity of prescribed fire. Koontz states “Only by understanding what causes a seed to germinate, survive, and grow can we look forward to continuing generations of Lewton’s Milkwort and other rare plants of Highlands County.”

Photo 1: Flowers of Lewton's Milkwort. Photo by Devon Picklum.



Photo 2: Archbold interns collecting seeds of Lewton's Milkwort for germination experiments. Photo by Archbold Biological Station.

