Diagnosing restoration trajectories using demographic modeling and modern coexistence theory

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Abstract

Restoration success is often measured by comparing target species abundance between restored and reference populations. Abundance may poorly predict long-term success, however, because seed addition may initially inflate restored population abundances, and reference population abundances may fluctuate with environmental variation. A demographic approach, informed by modern coexistence theory, may allow for more accurate diagnosis of restoration trajectories. We modeled population dynamics of an endangered plant (*Lasthenia conjugens*) in restored vernal pools and compared them to reference populations over 18 years (2000-2017). Model estimates of *L. conjugens* growth rates were better predictors of long-term trends than observed abundances. Although populations fluctuated in reference pools, annual rainfall variability acted as a stabilizing factor for *L. conjugens*. In restored pools however, invasive grasses and associated litter accumulation overrode the benefits of environmental variability. Our approach improves assessment of restoration outcomes and indicates when management actions, such as grass removal, will improve future trajectories.

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