

Postdoctoral Position in Plant Physiological Ecology

A funded NSF Postdoctoral Position is available in the Medeiros Lab at Holden Forests & Gardens (HF&G) to study the physiological climate tolerance of Red Cedar (*Juniperus virginiana*) in relation to recent range expansion of the species. We are looking for a highly motivated PhD with experience in eco-physiological techniques such as gas exchange, water relations and plant hydraulics. Experience with field-based sensor deployment would also be helpful. This position will offer opportunities to develop complementary research in plant physiology and the successful candidate will be responsible for mentoring undergraduate students working on the project. In addition to research endeavors, the successful candidate will lead and/or participate in public outreach activities which may include giving presentations for public audiences, leading workshops for K-12 or adult audiences, or representing the HF&G research department at public engagement events. This is a collaborative project between faculty at Kent State University, Denison University, The Ohio University and Holden Arboretum, and a description of the funded project is provided below. The successful candidate will join the research team based at the Holden Arboretum campus of HF&G (www.holdenarb.org), located in NE Ohio (east of Cleveland), and work will be conducted in greenhouse and/or field locations at the Holden Arboretum and Kent, and potentially other parts of the species range within the continental United States. The duration of this position is one year, with an option for renewal up to three years based on satisfactory performance reviews. This position is open to US citizens and permanent residents.

Interested applicants should have a PhD in biology, ecology, plant science or related discipline by the starting date. We will begin reviewing applications on August 15, 2019 and will continue until the position is filled. Positions may begin as early as September 1, 2019, but the start date is flexible. Interested applicants should apply online at www.holdenarb.org/about/work-with-us/. Complete applications will include a cover letter, curriculum vitae, a two-page statement of research and outreach interests, and names and addresses of three referees. For questions concerning the position please contact Juliana Medeiros (jmedeiros@holdenfg.org).

Project Abstract: Eastern Red Cedar (*Juniperus virginiana*) is native to the eastern United States, where this attractive tree has been a popular choice for landscaping. But out in the Great Plains, Red Cedar is known as the "green glacier", because this slow-growing species is taking over once-productive grasslands. Ranchers face substantial economic costs in removing Red Cedar from grazing lands, and it reduces grassland biodiversity through competition with native species. But how do you stop a "green glacier"? Populations might be expanding because environmental variability has altered frost and drought regimes, or because humans have implemented prairie management practices such as fire suppression, or even because of changes in the migration patterns of seed-dispersing birds. It is more likely, however, that many factors are at work. For example, environmental variability might allow plants to move into a new region, but seed dispersal by birds could promote population expansion within a region. Rather than focus on one factor, this study will determine the relative importance of several causal factors. Data from experiments will be used in a model that predicts the rate and locations where Red Cedar range expansion is likely to occur. Findings will be presented to the public at the Holden Arboretum Scientist Lecture Series and incorporated into Holden

Arboretum's "Working with Nature" K-12 Camp and "Tree Corp" adult workforce development program.

Uncovering scale-dependent mechanisms controlling range and niche expansion of plants is a key issue in biodiversity research. This work integrates physiological and ecological processes across scales to determine the potential for further range expansion. The central hypothesis is that, at a large spatial scale, changes in prairie management are more important than physiological climate tolerance for promoting range expansion, while at smaller scales, biotic factors such as avian dispersal, competition and facilitation are more important. The spatial scale of variation will be determined using microsatellites in historical, encroaching and niche expanding populations. The effects of fire will be examined using long-term data from the Konza Prairie NSF-LTER, while manipulative and field experiments will determine how the interaction of frost and drought impact Red Cedar performance. Seed dispersal by birds and changes in bird migration over time will be examined to determine how far, and where, birds disseminate Red Cedar. Empirical data will be integrated into a spatially explicit population-level age/stage matrix model, based on inputs from structural equation modeling at all three spatial scales, with spatial resolution determined by the results of microsatellite studies.

Holden Forests & Gardens (Holden Arboretum / Cleveland Botanical Garden) is an Equal Opportunity Employer committed to hiring a diverse and talented workforce. We seek skilled, knowledgeable and experienced individuals to join our staff and enhance our reputation as one of the country's foremost arboreta.