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**Climate Change Increases Proportion of Males in Plants with Separate Sexes, Posing Danger for Biological Communities**

***Plants affected may include asparagus, spinach, dates, mulberry and juniper.***

A paper published today by [*Nature Plants*](http://www.nature.com/articles/nplants2016109) finds that climate change will result in more male plants in species with separate sexes, known as dioecious plants. This shift to a higher proportion of males for many dioecious plant species could be extreme, disrupting normal reproduction and affecting insect and other animal populations that depend on these plants.

Researchers from Phoenix’s Desert Botanical Gardens, Northern Arizona University and the U.S. Geological Survey reviewed some 83 published studies to explore the effects of increased aridity on dioecious plant species. There are approximately 21,000 species of dioecious plants, examples of which include asparagus, spinach, dates, mulberry and juniper.

“Our findings indicate that dioecious plants are more sensitive to the effects of climate change than other plant species,” said lead author Kevin Hultine, research ecologist at the Desert Botanical Garden and NAU adjunct professor. “We anticipate that females will die off at a higher rate as conditions become drier, which could result in extreme male-biased sex ratios for a significant number of populations.”

Male dioecious plants are apparently better equipped to maintain rates of photosynthesis in a warmer climate. Female dioecious plants are disadvantaged in poor conditions, and males have the advantage in the dryer and warmer conditions projected to result from climate change. Additionally, for many of these plants, the rate of change in sex ratio caused by drier conditions may outpace the effects of natural sex-ratio rebalancing.

“By disproportionately killing female dioecious plants, climate change is reducing the effective population size available for reproduction, thereby reducing a population’s genetic diversity,” said Troy Wood, a U.S. Geological Survey research ecologist and co-author. “This imbalance may result in higher rates of inbreeding and the loss of beneficial genetic variation.”

Extreme increases in the ratio of male to female plants are more likely to occur in locations most affected by climate change, such as the Southwest, and for long-lived species like trees and bushes.

The effects of male-biased sex ratios are likely to affect ecosystem processes and the composition of insect and animal communities that depend on dioecious plants, especially those that are specialized on one sex. For example, female “edible valerian” plants, which are related to honeysuckle and found in mountain meadows, support up to four-times more aphids, as well as more aphid predators and aphid-tending ants, than male plants.

“Clearly, scientists need to resolve many unknowns that limit our ability to predict how climate change will influence dioecious plant species and the organisms that depend on them,” said Tom Whitham, NAU Regents’ Professor and co-author. “The use of reciprocal common gardens that mimic the projected effects of climate change, such as NAU’s Southwest Experimental Garden Array and University of Utah’s Rio Mesa Center, will help us understand why male and female plants have different local adaptation patterns.”

The paper’s other NAU co-authors include Kevin C. Grady, School of Forestry, and Stephen M. Schuster, Department of Biological Sciences.

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