

DROUGHT AND METAPOPOPULATION DYNAMICS OF A DESERT-DWELLING AMPHIBIAN

Erin R. Zylstra , Don E. Swann, Blake R. Hossack, Erin Muths , and Robert J. Steidl 

Study Description

Demographic rates and dispersal patterns of many species reflect variation in biotic and abiotic factors, yet few applications of metapopulation theory have explored temporal variation in colonization and extinction rates. We extended a dynamic occupancy model to allow variation in these rates, which we applied to 22 years of survey data for lowland leopard frogs (*Lithobates yavapaiensis*), a native amphibian that inhabits arid mountain canyons near the U.S.–Mexico border. Both extinction and colonization rates varied with hydrologic conditions, and frogs in one metapopulation were extirpated during a period of extreme drought.

Zylstra, E. R., D. E. Swann, B. R. Hossack, E. Muths, and R. J. Steidl. 2019. Drought and Metapopulation Dynamics of a Desert-Dwelling Amphibian. *Bull Ecol Soc Am* 100(2):e01517. <https://doi.org/10.1002/bes2.1517>



Photo 1. Bedrock-lined pool in a canyon in southern Arizona, USA. Lowland leopard frogs inhabit mid- to low-elevation reaches of intermittent streams. Areas outside of these canyons are arid, with almost no surface water. Photo credit: Erin R. Zylstra.



Photo 2. Photographs of the same pool in April (left) and July (right) of 2014, illustrating seasonal variation in the availability of surface water, a key resource for leopard frogs and a rich array of other vertebrates and invertebrates. Photo credit: Erin R. Zylstra.



Photo 3. An adult and juvenile lowland leopard frog. Given their reliance on surface water during larval stages and high rates of evaporative water loss after metamorphosis, this short-lived species is particularly vulnerable to reductions in surface water resulting from drought or sedimentation following wildfires in high-elevation forests. Photo credit: Erin R. Zylstra.

These photographs illustrate the article “Drought-mediated extinction of an arid-land amphibian: insights from a spatially explicit dynamic occupancy model” by E. R. Zylstra, D. E. Swann, B. R. Hossack, E. Muths, and R. J. Steidl, published in *Ecological Applications*. <https://doi.org/10.1002/eap.1859>