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Genetic Diversity of California Red-Legged Frogs in the Receding Southern Edge of Their Range

Since the 1960's, the California red-legged frog (*Rana draytonii*) has undergone extensive declines in heavily urbanized southern California, where the range edge has rapidly contracted northward and westward towards Santa Barbara County.

A study by the USGS Western Ecological Research Center published in *Evolutionary Applications* analyzes the genetic diversity of the red-legged frog populations along this shrinking range edge. Researchers analyzed the genetic structure and diversity of these frontline populations, and attempted to discern whether genetic diversity patterns were a result of long-term distribution shifts, or a result of population fragmentation due to recent disturbance from the Copper Fire, Topanga Fire, Crown Complex Fire and Station Fire.

Analysis confirms that California red-legged frogs exhibit a gradient in genetic diversity, with less diversity at the range edge and greater diversity towards the range center. Of the three edge populations, Aliso and East Las Virgenes showed the least genetic diversity.

Computer simulations indicate that low genetic diversity in isolated populations at the range edge dates back tens to several hundred generations ago. Thus, it is likely not a result of population isolation caused by recent wildfires and associated floods, debris flows, and losses in frog habitat and population connectivity.

However, isolation by recent wildfire impacts does put these edge populations at even greater risk of genetic bottlenecks and possible local extinction. If management plans seek to sustain edge populations and to slow the course of southern range contractions, the addition of translocated frogs may be needed to sustain evolutionary potential and to augment the genetic diversity of *Rana draytonii* populations in the southern range.

Management Implications

- Analysis confirms that California red-legged frogs exhibit a gradient in genetic diversity, with less diversity at the range edge and greater diversity towards the range center.
- Computer simulations suggest that low genetic diversity in isolated populations at the range edge dates back tens to several hundred generations ago, and not a result of recent population losses from wildfires and associated floods/debris flows.
- However, edge populations newly isolated by wildfire impacts are now at even greater risk of genetic bottlenecks. Diversity augmentation via the addition of translocated frogs may be needed to sustain edge populations and to slow the course of southern range contractions.

THIS BRIEF REFERS TO:

Richmond, JQ, KR Barr, AR Backlin, AG Vandergast, RN Fisher. 2013. Evolutionary dynamics of a rapidly receding southern range boundary in the threatened California Red-Legged Frog (*Rana draytonii*). *Evolutionary Applications*. doi: 10.1111/eva.12067

<http://www.werc.usgs.gov/ProductDetails.aspx?ID=4890>

<http://www.werc.usgs.gov/fisher>

<http://www.werc.usgs.gov/vandergast>



California red-legged frogs are federally listed as threatened throughout their range.