

## **Two California Lineages of *Oxalis oregana*: Genetic Evidence for a Pleistocene Separation into Northern and Southern Glacial Refugia**

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Pleistocene glacial refugia have been identified for many species based on fossil records, pollen distribution and genetic analysis. In the Pacific Northwest, there are discontinuities in the genetic lineages of several plant and animal species in the Northern California/Oregon region that are thought to have their origins in the separation of populations during glacial periods.

Redwood sorrel (*Oxalis oregana* Nutt.) is a common understory species of Pacific Northwest temperate rainforests with a distribution from the Big Sur coast of California to southern British Columbia. Genetic variation was assessed at two chloroplast DNA (cpDNA) intergenic spacers and the internal transcribed spacers (ITS-1 and ITS-2) of nuclear ribosomal DNA in seven populations of redwood sorrel collected from redwood state parks and reserves from Monterey County through Del Norte County.

In the five southernmost populations ranging from Big Sur to southern Humboldt County, individuals had “mixed” haplotypes (consisting of two related sequences) at both cpDNA loci caused by locus duplication or chimerism. The majority of individuals in the two northernmost populations (northern Humboldt County and Del Norte County) had single sequence cpDNA haplotypes at all loci. A similar phylogeographic pattern was observed with the ITS sequences where several closely related “southern” alleles were found from Big Sur to southern Humboldt County while a more divergent “northern” allele was dominant in the two northernmost populations.

These data are consistent with the separation of ancestral populations of redwood sorrel into a southern refugium (California) and a northern refugium (of unknown location) during the Pleistocene glaciations. There is evidence that these two groups are in contact and are hybridizing after post-glacial migration.